

CORONARY VASOSPASM: SIGNS, SYMPTOMS,
RISK FACTORS AND MANAGEMENT

by

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ABSTRACT

Registered nurses in the acute care setting are presented with the opportunity to interact with patients suffering from chest pain. One etiology behind chest pain, difficult to differentiate from the more common atherosclerosis, is coronary vasospasm. This health problem can be successfully identified based upon the presenting signs, symptoms, and risk factors. Nurses can then participate in carrying out medical and nursing management for this condition. An opportunity for continuing education is needed to update nursing knowledge. A review of professional literature was conducted and consistent themes derived that led to the development of a teaching project consisting of a pre and post evaluation, teaching slides, and a participant evaluation. This teaching project was designed to equip registered nurses, employed within a regional hospital, to recognize the signs, symptoms, and risk factors of coronary vasospasm as well as general medical and nursing management strategies. The teaching project was then made available to participants for a period of fourteen days via a computerized learning system available within the facility. The pre and post tests were then evaluated for differences in median and mean scores. Improvements in overall scores, as well as on the individual questions presented on the tests, were documented. These results lead to the conclusion that knowledge of the signs, symptoms, risk factors, medical, and nursing management increased following completion of the teaching project. Implications for future nursing practice, education, and research include the development of a teaching and evaluation tool that could be made available for continuing education on a larger scale to reach additional registered nurses.

INTRODUCTION

The number one reason for accessing health care throughout the world is chest pain (Mizra, 2005). Chest pain can originate from a number of sources including cardiac, pulmonary, musculoskeletal, gastrointestinal, or psychological (Dains, Baumann, & Scheibel, 2007). Discovering the cause of the chest pain is the responsibility of the health care team, and registered nurses in the acute care setting take part in this process.

Differential diagnosis of coronary vasospasm, as the etiology for angina pectoris, can be difficult due to the similarity in presenting symptoms with atherosclerotic coronary heart disease. However, making this distinction is essential to developing an appropriate treatment plan (Mirza, 2005).

Registered nurses in the acute care setting have the opportunity for early detection of the symptoms of coronary vasospasm. This can be accomplished through a detailed health history and careful clinical observation with the information subsequently provided to the physician, contributing to a timely and accurate diagnosis (Perchalski, 1987). Assessment of a patient's signs and symptoms, and communication of those findings to the physician, can significantly expedite accurate diagnosis and proper treatment (Mundt, 1984). In addition, registered nurses play a vital role in the education of patients and their families concerning medical diagnoses, medications, and prevention or treatment of any future exacerbations of illness.

This paper will detail a teaching project designed to increase the knowledge of the risk factors, signs, and symptoms of coronary vasospasm in registered nurses practicing

in the acute care setting. It will also discuss the recommended medical treatment and nursing interventions for a patient with this condition.

Purpose

There is a lack of current continuing education opportunities for nurses in the acute care setting concerning coronary vasospasm as an etiology for angina pectoris. The writer will develop an evidenced-based computerized, self directed teaching project designed to increase the registered nurse's current knowledge of signs, symptoms, risk factors, and management strategies associated with coronary vasospasm. Prior to completion of this project, participants will complete a pre-test followed by administration of the teaching slides and, finally, a post test will be administered to evaluate the effectiveness of the program in aiding the participants in the achievement of the learning objectives. An evaluation of the teaching project will also be included and required for participants to obtain accredited continuing education contact hours.

Learning Objectives

The first learning objective of this program is: Participants will be able to successfully describe risk factors and the common presentations of patients with coronary vasospasm. The attainment of this objective will include knowledge of factors associated with an increased risk of coronary vasospasm including medications, disease states, and lifestyle choices. This objective will also require participants to have knowledge of presenting patient characteristics found in those with coronary vasospasm including

typical electrocardiograph (EKG) changes, timing or onset of symptoms, and associated arrhythmias.

The second learning objective for this program, expanding on the knowledge required for the first objective, is: Given a patient scenario, participants will be able to successfully analyze patient characteristics and identify those signs and symptoms consistent with coronary vasospasm. This objective will require participants to review patient scenarios and apply the content of this module to clinical practice.

The third and final learning objective for this teaching project will be: Participants will be able to identify and implement appropriate nursing interventions for the management of patients with coronary vasospasm. This will include a basic understanding of medical management protocols including frequently used medications. This will also detail nursing management and the importance of patient education as an essential component in the prevention of future instances of coronary vasospasm.

Background

In review of the professional literature, only seven articles published in the 1980s were directed toward the continuing education of nurses in the identification and care of patients with coronary vasospasm (Bullas & Pfister, 1987; Foley & Brown, 1984; Kennedy, 1981; Lamb, 1985; Mundt, 1986; Padula, 1983; Perchalski & Pepine, 1987). No additional nursing related publications were identified. In review of the medical literature, fifteen additional articles are found, from the year 2003 to the year 2008, reporting findings of research or case studies (Anderson, Adams, Antman, Bridges,

Califf, Casey, 2007; Arias, Sanchez, & Fajardo, 2007; Chang, Wang, Chen, Huang, Chern, & Hsieh, 2005; Choi, Chung, Bae, Lee, Jeong, Kang et al., 2005; Hamon & Hamon, 2006; Ho, Chu, Cheng, Hsu & Lee, 2005; Hung, Hung, Cheng, Yang, Chergn, 2007; Joshi & Blackshear, 2003; Manini, Kabrhel, & Thomsen, 2005; Mirza, 2005; Romagnoli & Lanza, 2007; Sisi, Dahleen, & Gaspardone, 2008; Sovari, Cesario, Kocheril, & Brugada, 2008; Yasue, Nakagawa, Itoh, Harada & Mizuno, 2008; Yuksel, Celik, Iyisoy, Kursaklioglu, Amasyali, & Kose, 2007).

There have been no publications in professional nursing literature over the past five years. The writer intends to provide opportunity for continuing education with an update of current nursing knowledge of the signs, symptoms, risk factors, and management of coronary vasospasm through the provision of continuing education for nurses in the acute care setting through the development of a computerized teaching project.

Significance

Coronary heart disease, an overall group in which coronary vasospasm is classified, was responsible for one in five deaths in the United States in 2004, making it the number one killer of men and women. Direct and indirect costs of coronary heart disease in the United States, for the year 2007, were estimated at 151.6 billion dollars (American Heart Association, 2007).

Rates of myocardial infarction in patients with documented vasospasm-induced angina have been reported to be twenty to thirty percent in this population. Furthermore, life-threatening arrhythmias, such as complete heart block and ventricular tachycardia or

fibrillation, have also been associated with vasospasm of the right coronary and left anterior descending arteries (Mirza, 2005). Serious arrhythmias have also been seen in 5 to 10 percent of patients with documented coronary vasospasm (Romagnoli & Lanza, 2007).

Conceptual Framework

The American Association of Critical-Care Nurses (AACN), in the 1990's, visualized a new method of thinking in clinical practice to change from task-oriented nursing to meeting the various needs of patients in order to optimize outcomes of care. They formulated a group of nationally recognized experts who developed the synergy model for patient care.

The synergy model for patient care is based upon the idea that optimal patient outcomes are achieved when the needs or characteristics of patients are matched with the competencies of a nurse. Patient characteristics are categorized as follows: complexity, participation in decision making, participation in care, predictability, resiliency, resource availability, stability, and vulnerability (Hardin & Kaplow, 2005, p. 4). These patient characteristics are defined in Table 1.

Table 1. American Association of Critical-Care Nurses synergy model – patient characteristics (Hardin & Kaplow, 2005, 5).

Characteristic	Definition
Complexity	Entanglement of two or more issues or systems such as family, treatment, therapy
Participation in decision making	Engagement of the patient or family in decision making
Participation in care	Engagement of the patient or family in care
Predictability	Ability to expect a certain course of events
Resiliency	Ability to return to a prior level of functioning
Resource availability	Extent to which resources are present such as financial, psychological, social, and others
Stability	Ability to maintain equilibrium, responsiveness to therapy
Vulnerability	Extent of susceptibility to actual or potential stressors

Patient characteristics (Hardin & Kaplow, 2005) that apply to the signs and symptoms of patients with coronary vasospasm include: resiliency, stability, predictability, and participation in care. A patient's resiliency and stability may determine the degree of severity of signs and symptoms a nurse might recognize in a patient with coronary vasospasm and, conversely, the nurse's ability to recognize a patient's signs and symptoms might impact a patient's resiliency and stability.

In addition, the characteristic of predictability is relevant to patients experiencing coronary vasospasm as they may not follow the typical path of patients admitted with angina pectoris. Also essential to the overall nursing management of a patient with coronary vasospasm is participation in the care by the patient and family members in both their willingness and ability to implement lifestyle changes to manage this condition and reduce risk factors for future events.

In the synergy model, nurse competencies are categorized as follows: advocacy and moral agency, caring practices, clinical inquiry, clinical judgment, collaboration, facilitation of learning, response to diversity, and systems thinking. This model states that all competencies of nursing are important. However, each takes on more or less significance in accordance with individual patient needs (Hardin & Kaplow, 2005, p 4).

Nurse competencies are defined in Table Two.

Table 2. American Association of Critical-Care Nurses synergy model – nurse competencies (Hardin & Kaplow, 2005, 6).

Nurse Competencies	Definition
Advocacy and moral agency	Works on another's behalf, represents the interests of patients or family members, acts as a moral agent to resolve issues
Caring practices	Interventions and behaviors that create a therapeutic environment
Clinical inquiry	Ongoing process of questioning and evaluating practice
Clinical judgment	Clinical reasoning used to deliver care
Collaboration	Working with the patient, family, or interdisciplinary team members
Facilitation to learning	Promotes learning for patients, families, staff, and the community
Response to diversity	Ability to recognize, appreciate, and incorporate patient differences into the plan of care
Systems thinking	Ability to recognize the interconnected nature of a healthcare system

All nurse competencies (Hardin & Kaplow, 2005) are necessary for the provision of care to all patients and those likely emphasized in those with coronary vasospasm include: advocacy, caring practices, clinical judgment, and facilitation to learning. Nurses must possess knowledge of the typical presenting signs and symptoms of coronary vasospasm in order to utilize clinical judgment to identify the possibility of its

appearance. If suspecting coronary vasospasm, the nurse must communicate assessment findings to the physician, a process of patient advocacy. Another essential component to the care of patients with coronary vasospasm is client teaching and, in order to provide this intervention effectively, nurses must possess caring practices and facilitation of learning.

Summary

Patients suffering from coronary vasospasm can be difficult to identify from the larger group of individuals who suffer from chest pain. However, making the distinction is essential to the appropriate management of the health problem. Through the use of the Synergy Model for Patient Care (Hardin & Kaplow, 2005), the writer will develop a teaching project designed to equip registered nurses in the acute care setting to appropriately and effectively care for these patients and their families.

REVIEW OF LITERATURE

Guiding Framework and Related Literature

The AACN synergy model for patient care was designed to optimize patient outcomes in the acute care setting. This model states that, when individual patient characteristics are matched with appropriate nurse competencies, outcomes are the most advantageous for the patient (Hardin & Kaplow, 2005). One competency of nurses described by this model is clinical inquiry which it defined as “the ongoing process of questioning and evaluating practice; providing informed practice and innovating through research and experiential learning” (Hardin & Kaplow, 2005, p. 6). It is through clinical inquiry that the writer conducted this review of literature.

In the review of the literature, there were no articles identified that utilized the AACN synergy model for patient care directed toward the topic the writer wishes to explore. There are, however, multiple articles describing case studies and the application of this model in practice.

Hardin and Hussey (2003) depicted an 82-year-old female patient, admitted to the acute care setting for congestive heart failure, describing her multiple characteristics ranging from physical presentation to social needs as well as the respective nurse competencies needed to achieve optimal outcomes. Yellen (2007) described the use of this model in achieving optimal patient outcomes following percutaneous transluminal angioplasty.

Several research studies were found addressing the use of the AACN synergy model for patient care as a conceptual framework. Smith (2007) employed this model in a

descriptive study of nurses' individual spirituality and their initial assessments of patients' spirituality. Kuriakose (2008) utilized this model in research to investigate the practice of suctioning endotracheal tubes. Ferguson (2007) used the model in the evaluation of the presence of fever in intensive care patients.

Freyling, Keston, and Heath (2008) detailed the use of the AACN synergy model as the basis of nursing care in a military intensive care unit in Iraq. There is also literature documenting the use of this model as the basis for the delivery and evaluation of nursing care within an organization (Kaplow & Reed, 2008).

Other uses of the synergy model, very applicable to the current research, include utilization of the model in relationship to education. The nurse competencies and patient characteristics are easily adapted to optimize the outcomes within the nurse educator and learner relationship (Reed, 2006). Patient characteristics become learner characteristics and nursing competencies become those of the educator. The characteristics of learners are summarized in Table Three.

Table 3. Synergy model of nursing education – learner characteristics (Green, 2006, 279).

Learner Characteristics	Definition
Experiences	Social and educational influences that might affect learning
Participation in decision making	Engagement in the decision making process
Participation in learning	Engagement in the learning process
Predictability	Characteristic that leads to an expectation reading the trajectory of learning
Resiliency	Ability to adapt to different teaching and learning styles
Resource availability	Resources such as financial, social, psychological, technical, and personal that students bring with them
Readiness	Preparedness and motivation to learn
Vulnerability	Susceptibility to actual or potential stressors

The nurse competencies from the AACN synergy patient care model are also easily adapted for use in nursing education. In this context, they are competencies held by nurse educator and are summarized in Table 4.

Table 4. Synergy model of nursing education – nurse educator competencies (Green, 2006, 279).

Nurse Educator Competencies	Definition
Clinical judgment and reasoning	Clinical knowledge and experience used to develop learners
Advocacy and moral agency	Advocating for success of the learner
Caring practices	Responsive to the uniqueness of learners
Collaboration	Working with the learner and others to achieve goals
Systems thinking	Recognize and use resources to promote learning
Response to diversity	Incorporate individual differences into learning plan
Clinical inquiry	Questioning and evaluating practice
Facilitator of learning	Use of self to facilitate learning

Review of Literature Related to Project Content

Literature addressing the topic of coronary vasospasm, published in the last five years, appears to be directed toward health care providers in general rather than towards nursing in particular (Anderson et al, 2007; Arias, et al, 2007; Chang et al, 2005; Choi et al, 2005; Ferguson, 2007; Hamon & Hamon, 2006; Ho et al, 2005; Hung et al, 2007; Joshi & Blackshear, 2003; Makaryus et al, 2008; Manini et al, 2005; Mirza, 2005; Romagnoli & Lanza, 2007; Sidi et al, 2008; Sovari et al, 2008; Yasue et al, 2008; Yuksel et al, 2007). There were, however, articles published in nursing journals in the 1980s (Bullas, 1987; Foley & Brown, 1984; Lamb, 1985; Mundt, 1986; Padula, 1983;

Perchalski, 1987). The writer will summarize and utilize data published within the past five years in the following review of literature as well as for the basis of the evidence-based teaching project. Articles written in nursing journals in the 1980s will also be summarized separately due to their significance as the only publications directed toward the continuing education of nursing.

Discussion of coronary vasospasm in the literature consistently brings forth themes of patient characteristics (Choi, et al., 2005; Manlnl et al, 2005; Mirza, 2005; Sidi et al, 2008; Yasue et al., 2008), presentation (Arias et al, 2007; Hamon & Hamon, 2006; Ho et al., 2005; Hung, et al., 2007; Joshi & Blackshear, 2003; Makaryus, et al., 2008; Manlnl et al, 2005; Mirza, 2005; Sovari, et al., 2008; Yasue, et al., 2008; Yuksel, et al., 2007), and management (Bullas, 1987; Foley & Brown, 1984; Hung et al, 2007; Lamb, 1985; Mundt, 1986; Padula, 1983; Perchalski, 1987; Yasue et al., 2008). The first of these to be discussed is risk factors or preceding conditions that have been associated with an increased likelihood of developing coronary vasospasm. Next, EKG changes and environment are addressed depicting frequently seen signs and symptoms demonstrated by patients with coronary vasospasm. Following these themes are arrhythmias often associated with vasospasm and, finally, medical and nursing management.

Risk Factors

Patients with coronary vasospasm may not demonstrate the same risk factors as patients with atherosclerotic coronary artery disease (with the exception of cigarette smoking) and are typically younger (Mirza, 2005). The problem has been documented equally in men and women. Citizens of Asian countries appear to have a higher incidence

of coronary vasospasm than those of the United States of America or Europe indicating the possibility of a genetic component (Yasue et al., 2008). Hyperthyroidism, associated with coronary vasospasm, received attention in a study conducted in Korea particularly in young female patients (Choi, et al., 2005). Other conditions associated with increased risk of coronary vasospasm include: stress, exposure to cold, hyperventilation, and magnesium deficiency (Yasue, et al., 2008).

The use of pharmacological substances has been associated with increased risk of coronary vasospasm. These include: catecholamines, such as epinephrine; parasympathomimetic agents, such as acetylcholine; anticholinesterase agents; serotonin; histamine; beta adrenergic blockers; cocaine; alcohol; smoking; and withdrawal from chronic nitroglycerin (Yasue et al., 2008). Manlnl, Kabrhel and Thomsen (2005) reported a case study of a previously healthy 32-year-old man who suffered a coronary vasospasm leading to myocardial infarction 45 minutes after taking a common over-the-counter cold medication containing pseudoephedrine. It should be noted that pseudoephedrine is present in many over-the-counter cold and flu medications, and may be associated with coronary vasospasm in some patients (Manlnl et al, 2005).

Coronary vasospasm during surgical procedures has been implicated in cases of sudden death (Sidi et al, 2008). A case of documented coronary vasospasm in a patient with no previous history, while under anesthesia for a surgical procedure, led to first ST-segment elevation followed by pulseless ventricular tachycardia. The patient was converted to a normal sinus rhythm with advanced cardiac life support protocol and ST-segment elevation resolved following several minutes of intravenous nitroglycerin.

EKG Changes

One of the hallmark indications of coronary vasospasm is a transient elevation of the ST segment on electrocardiograph (EKG) monitoring during episodes of chest pain with return to baseline at resolution of chest pain (Mirza, 2005). Less often, patients may exhibit ST depression, T wave inversion or increased amplification, R on T waves, and transient Q waves on EKG analysis during episodes of chest pain (Yasue et al, 2008). ST segment changes may also occur on EKG tracings prior to a patient's awareness of, or completely without, reports of chest pain (Yasue et al, 2008).

Coronary vasospasm may occur without the presence of EKG changes and is thought in those situations to be indicative of collateral blood flow or mild disease (Manlnl et al, 2005). A case study of asymptomatic coronary vasospasm involving collateral circulation is described by Hamon and Hamon (2006).

Environment

Another trait of coronary vasospasm, that can differentiate the cause from more classical atherosclerotic heart disease, is the time of day or pattern of the patient's reported chest pain. Most often, patients describe chest pain that occurs most often in the early morning or awakens them at night and lasts for a period of just seconds to twenty minutes (Yasue et al, 2008). This phenomenon is generally not associated with periods of activity or exercise, as is atherosclerotic-induced chest pain, but may be triggered by cold, or hyperventilation (Joshi & Blackshear, 2003).

Emotional stress or distress has also been associated with the onset of coronary vasospasm (Makaryus et al, 2008). In some patients, exercise-related symptoms may

occur, possibly due to a combination of coronary vasospasm and atherosclerotic lesions (Hung et al, 2007). One case study, presented in the literature, described a 59-year-old man who suffered complete atrioventricular block during an exercise treadmill test as a result of coronary vasospasm, providing evidence that typical presentation may not always apply (Ho et al, 2005).

Arrhythmias

Patients demonstrating arrhythmias may actually be experiencing coronary vasospasm. Multiple arrhythmias have been associated with spasm of the coronary arteries including: ventricular tachycardia, premature ventricular contractions, ventricular fibrillation, and varying degrees of heart block (Yuksel et al, 2007). Coronary vasospasm has also been associated with sudden cardiac death, as the result of these arrhythmias, as was demonstrated with the documented sudden cardiac death of a patient during outpatient EKG monitoring (Arias et al, 2007).

In some patients, syncope rather than chest pain, may be the first indication of coronary vasospasm. One such case describes a gentleman who experienced a cardiac arrest followed by placement of an automated internal defibrillator. Over the ensuing year, the patient reported frequent defibrillator discharges preceded only by a sensation of dizziness and were found to be caused by ventricular tachycardia. Subsequently, the patient underwent a coronary catheterization which spontaneously demonstrated significant coronary vasospasm leading to the arrhythmia (Sovari et al, 2008).

Medical Management

Angina pectoris, caused by coronary vasospasm, is most often quickly relieved by the administration of sublingual, intravascular, or intracoronary nitroglycerin (Hung et al, 2007). Long term management and prevention of further coronary vasospasm is done with the use of calcium channel blockers. Cases of vasospasm that are refractory or resistant may also require the use of long acting nitrates (Yasue et al, 2008).

Nursing Management

Nurses in the acute care setting have the opportunity to assist in the explication of an accurate medical diagnosis. This can be achieved through the identification of risk factors, signs and symptoms and the communication of such findings to the physician (Foley & Brown, 1984).

Another key function of nurses in any setting is that of patient education. This includes explanation of the disease process, prevention of future complications through the reduction of risk factors, and appropriate actions should coronary vasospasm occur again in the future (Perchalski, 1987). An emphasis on risk reduction is essential including smoking cessation and avoidance of medications known to be associated with coronary vasospasm (Foley & Brown, 1984).

Data from Nursing Journals

In the 1980's, information was published in nursing journals for the purpose of providing registered nurses with information concerning risk factors, sign, symptoms, and nursing management of patients with coronary vasospasm (Bullas, 1987; Foley &

Brown, 1984; Lamb, 1985; Mundt, 1986; Padula, 1983; Perchalski, 1987). One of these (Mundt, 1986) provided for the completion of continuing education credits. No similar articles have been published since that time in nursing literature. The cumulative evidence presented in the literature is described in the previous sections.

Summary

The literature provides a clear picture of what is known by the health care community regarding the signs and symptoms in the presentation of a patient with coronary vasospasm as an underlying etiology for angina pectoris. Recent research (Anderson et al, 2007; Arias, Sanchez & Fajardo, 2007; Chang et al, 2005; Choi et al, 2005; Fergusen, 2007; Hamon & Hamon, 2006; Ho et al, 2005; Hung et al, 2007; Joshi & Blackshear, 2003; Makaryus et al, 2008; Maninl et al, 2005; Mirza, 2005; Romagnoli & Lanza, 2007; Sidi et al, 2008; Sovari et al., 2008; Yasue et al., 2008; Yuksel et al., 2007) appears to focus primarily on case studies and possible pathophysiological origins of coronary vasospasm. Publications are lacking that describe nursing knowledge, duties, and roles in the management of a patient with this health problem in the acute care setting. Nursing literature was published to address education concerning the identification and management of coronary vasospasm in the 1980s with little follow up since then (Bullas, 1987; Foley & Brown, 1984; Lamb, 1985; Mundt, 1986; Padula, 1983; Perchalski, 1987).

METHODS

Target Audience

This teaching project was designed for delivery to registered nurses, employed within the acute care setting, in an area or unit in which direct contact occurs with patients experiencing chest pain. A regional hospital with emergency and cardiac services was chosen as the location for delivery of this project.

Project Development

The characteristics of learners must be considered just as those of patients within the synergy care model. However, certain characteristics will carry more emphasis in any particular situation. In this case, important learner characteristics to consider are: experiences, resiliency, and readiness. The previous experiences of a potential participant affect their perception of the importance of the issue as well as their personal knowledge base. Resiliency must be taken into consideration as this educational program is offered only by means of a computerized delivery system. Readiness is also very important as motivation and preparedness to participate in the project and learn the material are essential to optimal learning outcomes.

In development based on the synergy model for patient care, nurse competencies are utilized as instructor competencies. This teaching project emphasizes clinical inquiry in the evaluation of current knowledge through the use of a pre test to be completed prior to the teaching project and the introduction of evidence based knowledge within the

program. The writer also employed clinical judgment and reasoning in the development of the instructional intervention. Advocacy is employed, within this project, through the use of a delivery means that is available to all nurses at times convenient to them. Caring practices and response to diversity are utilized through the development of a teaching project with consideration for different learning styles as well as allowing participants unlimited time to review the material and complete the required post evaluation. Collaboration with members of the education department at the regional hospital was necessary for the development of this teaching project as was collaboration with the management staff charged with overseeing the registered nurses. Systems thinking is also used in the utilization of the available computerized learning system through the education department for the delivery of the information allowing participants to access information at individualized times.

Project Implementation

Initially, the director of nursing as well managers from the medical, surgical, intermediate care, intensive care, emergency and cardiac catheterization lab units were contacted to discuss their willingness to have this teaching project available to the registered nurses employed within their departments. Following agreement by the management staff, flyers were placed throughout the facility in staff lounges announcing the project, its content and availability. This information was also announced at staff meetings and the project was made available to all nurses, working within these departments, by means of the computerized learning system utilized within the facility.

Following the announcement and explanation of the study at staff meetings and the placement of informative flyers throughout the facility in staff lounges, the teaching project was made available to all registered nurses for a period of fourteen days. The teaching project, as well as pre and post evaluations were administered via the computerized system.

Teaching Project Components

This teaching project requires the participant to complete several steps including a pre-test, educational content and, finally, a post-test. Participants began by completing a pre test (Appendix A) to evaluate their base level of knowledge prior to completing the educational content. They were then guided through self paced educational content (Appendix B) consisting of text and photographs. Upon completion of the educational content, participants were then directed to again complete the same evaluation of knowledge (post-test) (Appendix A) in order to provide evaluative data regarding the teaching project. Finally, participants will be asked to complete a project evaluation (Appendix C) designed to encourage the participants' assessment of the project's effectiveness in meeting the stated learning objectives. The educational content was developed by the writer utilizing the conceptual framework of the AACN synergy model (Hardin & Kaplow, 2005). This teaching project was submitted and accredited by the state nurses association for continuing education credits through the education department at a regional hospital.

Pre and Post Evaluation

The pre and post evaluations began with a series of three questions designed to gather demographic data from each participant concerning their primary department, years of experience, and recent completion of continuing education hours. The evaluation consisted of fifteen multiple choice questions that test the participant's knowledge of information covered within the teaching project. Information obtained from this evaluation prior to, and following completion of, the teaching project provided information concerning the underlying knowledge base of registered nurses related to coronary vasospasm as well as the utility of this teaching project to increase that knowledge base.

Data gathered from these pre and post evaluations was used to evaluate the baseline knowledge of nursing staff within the facility as well the overall effectiveness of the teaching project. Scores were also compared based on the demographic data collected related to the primary department, years of nursing experience, and recent participation in continuing education. The data was analyzed to determine mean scores both overall and individually per question.

Teaching Project Content

The teaching project was a self-directed twenty slide presentation that participants can navigate. The project was designed for delivery via a computerized system in order to allow participants to complete the requirements during times convenient for them. The slides provided information on the themes consistently found throughout the literature including the risk factors for coronary vasospasm and the frequently seen characteristics

of patients presenting with coronary vasospasm. The risk factors presented in the slide presentation include cigarette smoking, selected medications and medical conditions (Choi et al, 2005; Manlnl et al, 2005; Mirza, 2005; Sidi et al, 2008; Yasue et al, 2008). Patient characteristics discussed that are consistent with coronary vasospasm include EKG changes (Hamon & Hamon, 2006; Manlnl et al, 2005; Mirza, 2005; Yasue et al, 2008), timing of the onset of symptoms (Hung et al, 2007; Joshi & Blackshear, 2003; Makaryus et al, 2008; Yasue et al, 2008), and associated arrhythmias (Arias et al, 2007; Ho et al, 2005; Sovari, et al, 2008; Yasue et al, 2008).

Project Evaluation

The final activity that participants in this teaching project were guided though was an overall evaluation of the project. This evaluation included questions related to the overall effectiveness of the teaching project including evaluation of the organization, design, and delivery of the content as well as questions related to satisfactory completion of individual objectives. Space was also provided to encourage participants to give any additional comments and suggestions for improvement.

Summary

The teaching and the evaluation instrument were developed by the writer for the purpose of this educational program. Both are evidenced based and utilized information from professional literature (Anderson et al., 2007; Arias et al, 2007; Bullas & Pfister, 1987; Chang et al, 2005; Choi et al, 2005; Foley & Brown, 1984; Hamon & Hamon, 2006; Ho et al, 2005; Hung et al, 2007; Joshi & Blackshear, 2003; Kennedy, 1981; Lamb,

1985; Maninl et al, 2005; Mirza, 2005; Mundt, 1986; Padula, 1983; Perchalski & Pepine, 1987; Romagnoli & Lanza, 2007; Sisi et al, 2008; Sovari et al, 2008; Yasue et al, 2008; Yuksel et al, 2007) and are designed to meet the learning objectives of this educational module.

RESULTS

The teaching project was made available for a period of fourteen days, and was utilized by a total of twenty nine registered nurses, working in a variety of departments within a regional hospital. The results of all the pre and post tests, as well as the program evaluations, were then analyzed for question and total test score changes following review of the teaching project slides.

Results

The results of this teaching project will be presented first by primary department in order to make comparisons. Other demographic data including number of years experience within acute care nursing, as well as recent involvement in continuing education will also be reported by individual department following presentation of the comprehensive results.

Overall Results

A total of twenty-nine registered nurses participated in this teaching project. A summary of the reported years of clinical experience and number of continuing education units completed in the previous six months can be found on Tables Five and Six.

Table 5: Summary of Years of Clinical Nursing Experience of Participants.

How many years have you worked in acute care nursing?	Percentage of Answers (# of responses)
Less than one	7 (2)
One to five	17 (5)
Six to ten	31 (9)
Eleven to fifteen	0 (0)
Fifteen to twenty	17 (5)
Greater than twenty	28 (8)

Table 6: Summary of Number of Continuing Education Units Completed in Previous Six Months

How many continuing education units have you completed in the past six months?	Percentage of Answers (# of responses)
Less than three	31 (9)
Three to Six	59 (17)
Seven to Twelve	3 (1)
Greater than twelve	7 (2)

The total median score on the pretest was sixty percent or twelve correct out of eighteen questions. The range of scores was sixty with the lowest score being forty-three percent and the highest being ninety-three percent. Following review of the teaching slides, the median score for the total group on the post test was ninety-three percent or twenty-eight correct out of the total twenty-nine. The range of scores was thirty-three

with the lowest score being sixty-seven percent and the highest being one hundred percent. Responses to specific test questions are reported in the following table.

Table 7: Comprehensive Pre/Post Test Results

Test question	Pretest Percent Correct (# of responses)	Post Test Percent Correct (# of responses)
1. Coronary vasospasm is caused by a. a build-up of plaque on the internal artery wall a. electrolyte imbalances b. an abnormal contraction of a coronary artery (correct) c. the development of a thrombus.	93 (27)	100 (29)
2. Coronary vasospasm occurs most often a. at the initiation of strenuous activity b. during periods of rest (correct) c. following strenuous activity d. unrelated to activity level	10 (3)	79 (23)
3. The most significant risk factor for coronary vasospasm is a. poor diet b. family history c. obesity d. smoking (correct)	45 (13)	93 (27)
4. Coronary vasospasm has been associated with a. hypertension, hypercalcemia b. hyperthyroidism, magnesium deficiency c. hyperlipidemia, hypertension d. hypothyroidism, hypernatremia	35 (10)	97 (28)
5. The classic EKG finding associated with coronary vasospasm is a. inverted T waves b. ST segment depression c. ST segment elevation (correct) d. peaked T waves	45 (13)	90 (26)
6. Patients with coronary vasospasm often report symptoms a. occurring at work b. occurring early in the morning (correct) c. occurring after meals d. occurring in the afternoon	55 (16)	100 (29)
7. Coronary vasospasm has been associated with use of a. acetaminophen b. decongestants (correct) c. NSAIDs d. antihistamines	38 (11)	79 (23)
8. Patients with coronary vasospasm may experience a. chest pain b. myocardial infarction c. arrhythmias d. all of the above (correct)	96 (28)	100 (29)

Table 7: Continued

<p>9. In which of the following patients would you suspect coronary vasospasm?</p> <p>a. a 72 year old man with a history of hypertension and hyperlipidemia who presents with exertional chest pain</p> <p>b. a 54 year old woman with a history of type I diabetes who presents with a “burning” pain in the center of her chest one hour after dinner</p> <p>c. a 36 year old man with no medical history who presents with dizziness and chest pain occurring early in the morning and unrelated to activity (correct)</p> <p>d. a 47 year old man with a history of obesity and hypertension who presents with occasional “stabbing” chest pains throughout the day</p>	52 (15)	93 (27)
<p>10. A patient with coronary vasospasm is most likely to be discharged with a prescription for a /an</p> <p>a. beta blocker</p> <p>b. ace inhibitor</p> <p>c. calcium channel blocker (correct)</p> <p>d. anti-arrhythmic</p>	45 (13)	86 (25)
<p>11. Risk for coronary vasospasm may have a genetic component.</p> <p>a. true (correct)</p> <p>b. false</p>	97 (28)	100 (29)
<p>12. Coronary vasospasm has been associated with fatal arrhythmias.</p> <p>a. true (correct)</p> <p>b. false</p>	97 (28)	100 (29)
<p>13. Acute coronary vasospasm can be appropriately treated with nitroglycerin.</p> <p>a. true (correct)</p> <p>b. false</p>	76 (22)	100 (29)
<p>14. Cardiac arrhythmia is sometimes the only presenting symptom of coronary vasospasm.</p> <p>a. true (correct)</p> <p>b. false</p>	79 (23)	97 (28)
<p>15. Coronary vasospasm is most often seen in middle aged women.</p> <p>a. true</p> <p>b. false (correct)</p>	52 (15)	69 (20)

The percentage answered correctly improved on all questions from the pretest to the post test. The comprehensive median score increased thirty-three percentage points from sixty to ninety-three percent.

Medical/Surgical Nursing

There were a total of nine participants who designated medical nursing as their primary department and one who reported surgical nursing as their primary department. These two departments will combined together due to their small size for the purpose of this analysis.

Of this group, twenty percent or two participants reported a history of less than one year of nursing experience. Ten percent or one participant reported one to five years of nursing experience. Sixty percent or six of the nurses from these departments reported six to ten years of nursing experience. Ten percent or one participant indicated that they had fifteen to twenty years of nursing.

Also, twenty percent or two members of this group reported participating in less than three continuing education units over the past six months while sixty percent or six members stated they had completed three to six. Ten percent or one participant reported completion of six to twelve, and the remaining ten percent or one participant indicated completion of greater than twelve.

From this group of registered nurses, the median score on the pretest evaluation was fifty-three percent with a mean score of fifty-six percent or ten correct out of eighteen total questions. Scores were forty-seven percent at the lowest and seventy-three at highest for a range of twenty six. Following completion of the teaching slides, this group of participants had an overall median score of ninety-three percent on the post test with a mean of eighty-nine percent or sixteen correct out of eighteen total questions. The lowest score on the post test was sixty-seven percent and the highest was one hundred

percent for a range of thirty-three. Responses to specific test questions are reported in the following table.

Table 8: Medical/Surgical Nursing Pre/Post Test Results

Test question	Pre Test Percent Correct (# of Responses)	Post Test Percent Correct (# of Responses)
1. Coronary vasospasm is caused by a. a build-up of plaque on the internal artery wall b. electrolyte imbalances c. an abnormal contraction of a coronary artery (correct) d. the development of a thrombus.	100 (10)	100 (10)
2. Coronary vasospasm occurs most often a. at the initiation of strenuous activity b. during periods of rest (correct) c. following strenuous activity d. unrelated to activity level	0 (0)	100 (0)
3. The most significant risk factor for coronary vasospasm is a. poor diet b. family history c. obesity d. smoking (correct)	40 (4)	100 (10)
4. Coronary vasospasm has been associated with a. hypertension, hypercalcemia b. hyperthyroidism, magnesium deficiency (correct) c. hyperlipidemia, hypertension d. hypothyroidism, hypernatremia	20 (2)	100 (10)
5. The classic EKG finding associated with coronary vasospasm is a. inverted T waves b. ST segment depression c. ST segment elevation (correct) d. peaked T waves	20 (2)	90 (9)
6. Patients with coronary vasospasm often report symptoms a. occurring at work b. occurring early in the morning (correct) c. occurring after meals d. occurring in the afternoon	30 (3)	100 (10)
7. Coronary vasospasm has been associated with use of a. acetaminophen b. decongestants (correct) c. NSAIDs d. antihistamines	40 (4)	60 (6)
8. Patients with coronary vasospasm may experience a. chest pain b. myocardial infarction c. arrhythmias d. all of the above (correct)	90 (9)	100 (10)

Table 8: Continued

<p>9. In which of the following patients would you suspect coronary vasospasm/</p> <ul style="list-style-type: none"> a. a 72 year old man with a history of hypertension and hyperlipidemia who presents with exertional chest pain b. a 54 year old woman with a history of type I diabetes who presents with a “burning” pain in the center of her chest one hour after dinner c. a 36 year old man with no medical history who presents with dizziness and chest pain occurring early in the morning and unrelated to activity (correct) d. a 47 year old man with a history of obesity and hypertension who presents with occasional “stabbing” chest pains throughout the day 	20 (2)	100 (10)
<p>10. A patient with coronary vasospasm is most likely to be discharged with a prescription for a /an</p> <ul style="list-style-type: none"> a. beta blocker b. ace inhibitor c. calcium channel blocker (correct) d. anti-arrhythmic 	40 (4)	70 (7)
<p>11. Risk for coronary vasospasm may have a genetic component.</p> <ul style="list-style-type: none"> a. true (correct) b. false 	100 (10)	100 (10)
<p>12. Coronary vasospasm has been associated with fatal arrhythmias.</p> <ul style="list-style-type: none"> a. true (correct) b. false 	100 (10)	100 (10)
<p>13. Acute coronary vasospasm can be appropriately treated with nitroglycerin.</p> <ul style="list-style-type: none"> a. true (correct) b. false 	90 (9)	100 (10)
<p>14. Cardiac arrhythmia is sometimes the only presenting symptom of coronary vasospasm.</p> <ul style="list-style-type: none"> a. true (correct) b. false 	100 (10)	100 (10)
<p>15. Coronary vasospasm is most often seen in middle aged women.</p> <ul style="list-style-type: none"> a. true b. false (correct) 	50 (5)	10 (10)

As is demonstrated in the above table, all questions, with scores less than one hundred percent on the pretest, demonstrated improvement in the post test. The overall median score increased by fifty points from forty-three to ninety-three percent.

Intermediate Care/Intensive Care/Cardiac Catheterization

A total of seven registered nurses, who consider intermediate care as their primary department, completed the teaching project. A total of four nurses within the intensive care department and two registered nurses within the cardiac catheterization department completed the teaching project. These groups frequently work together in the care of patients with cardiac conditions and their cumulative data are presented together.

Within this group, thirty-one percent or four participants reported one to five years of experience and twenty-three percent or three participants indicated six to ten years of clinical nursing experience. Fifteen percent or two participants reported sixteen to twenty years of experience and thirty-one percent or four nurses indicated greater than twenty years of clinical nursing experience. Also within the group, forty-six percent or six participants reported less than three continuing education courses in the previous six months and the remaining fifty-four percent or seven participants reported three to six continuing education units in the past six months.

Within this group, the median score on the pretest was sixty-seven percent or thirteen correct out of eighteen total questions with a mean score of sixty-four percent. The range of scores was just six with a low score of sixty-seven percent and a high score of seventy-three percent. The post test for this group yielded a median score of ninety-three percent or seventeen correct out of eighteen with a mean score of ninety-two percent. The range of scores was twenty-three with the lowest score being eighty-seven percent and the highest being one hundred percent. Responses to specific test questions are reported in the following table.

Table 9: Intermediate/Intensive/Cardiac Catheterization Care Nursing Pre/Post Test Results

Test question	Pretest Percent Correct (# of responses)	Post Test Percent Correct (# of responses)
1. Coronary vasospasm is caused by a. a build-up of plaque on the internal artery wall b. electrolyte imbalances c. an abnormal contraction of a coronary artery (correct) d. the development of a thrombus.	85 (11)	100 (13)
2. Coronary vasospasm occurs most often a. at the initiation of strenuous activity b. during periods of rest (correct) c. following strenuous activity d. unrelated to activity level	15 (2)	92 (12)
3. The most significant risk factor for coronary vasospasm is a. poor diet b. family history c. obesity d. smoking (correct)	46 (6)	92 (12)
4. Coronary vasospasm has been associated with a. hypertension, hypercalcemia b. hyperthyroidism, magnesium deficiency c. hyperlipidemia, hypertension d. hypothyroidism, hypernatremia	46 (6)	100 (13)
5. The classic EKG finding associated with coronary vasospasm is a. inverted T waves b. ST segment depression c. ST segment elevation (correct) d. peaked T waves	54 (7)	100 (13)
6. Patients with coronary vasospasm often report symptoms a. occurring at work b. occurring early in the morning (correct) c. occurring after meals d. occurring in the afternoon	69 (9)	100 (3)
7. Coronary vasospasm has been associated with use of a. acetaminophen b. decongestants (correct) c. NSAIDs d. antihistamines	46 (6)	89 (11)
8. Patients with coronary vasospasm may experience a. chest pain b. myocardial infarction c. arrhythmias d. all of the above (correct)	100 (13)	100 (13)

Table 9: Continued

9. In which of the following patients would you suspect coronary vasospasm/ a. a 72 year old man with a history of hypertension and hyperlipidemia who presents with exertional chest pain b. a 54 year old woman with a history of type I diabetes who presents with a “burning” pain in the center of her chest one hour after dinner c. a 36 year old man with no medical history who presents with dizziness and chest pain occurring early in the morning and unrelated to activity (correct) d. a 47 year old man with a history of obesity and hypertension who presents with occasional “stabbing” chest pains throughout the day	69 (9)	92 (12)
10. A patient with coronary vasospasm is most likely to be discharged with a prescription for a /an a. beta blocker b. ace inhibitor c. calcium channel blocker (correct) d. anti-arrhythmic	62 (8)	100 (13)
11. Risk for coronary vasospasm may have a genetic component. a. true (correct) b. false	100 (13)	100 (13)
12. Coronary vasospasm has been associated with fatal arrhythmias. a. true (correct) b. false	92 (12)	100 (13)
13. Acute coronary vasospasm can be appropriately treated with nitroglycerin. a. true (correct) b. false	69 (9)	100 (13)
14. Cardiac arrhythmia is sometimes the only presenting symptom of coronary vasospasm. a. true (correct) b. false	62 (8)	93 (12)
15. Coronary vasospasm is most often seen in middle aged women. a. true b. false (correct)	38 (5)	62 (8)

As demonstrated in the above table, all questions not correct, one hundred percent of the time on the pretest were improved on the post test. The median score increased from sixty-seven to ninety-three percent; a difference of twenty-six percentage points.

Nursing Supervisor/Care Coordinator

A total of six participants reported supervisory, or care coordination, as their primary department. Within this group, thirty-three percent or two participants reported fifteen to twenty years of clinical nursing experience and sixty-six percent or four nurses indicated greater than twenty years of experience. Seventeen percent or one participant reported completion of less than three continuing education units in the preceding six months while the sixty-six percent or four participants indicated completion of three to six continuing education units in the same time period. The remaining seventeen percent or one participant reported completion of greater than twelve units of continuing education over the previous six months.

Of this group, the median score for the pretest was sixty-one percent or eleven correct out of eighteen with a mean score of sixty-three percent. The range of scores was sixty with the lowest score being forty-four percent and the highest being ninety-four percent. The median score on the post test for this group was ninety-four percent or seventeen correct out of eighteen total questions with a mean of ninety-three percent. The post test scores had a range of twelve with the lowest score being eighty-eight percent and the highest being one hundred percent. Responses to specific test questions are reported in the following table.

Table 10: Nursing Supervisor/Care Coordinator Pre/Post Test Results

Test question	Pretest Percent Correct (# of Responses)	Post Test Percent Correct (# of Responses)
1. Coronary vasospasm is caused by a. a build-up of plaque on the internal artery wall b. electrolyte imbalances c. an abnormal contraction of a coronary artery (correct) d. the development of a thrombus.	100 (6)	100 (6)
2. Coronary vasospasm occurs most often a. at the initiation of strenuous activity b. during periods of rest (correct) c. following strenuous activity d. unrelated to activity level	17 (1)	83 (5)
3. The most significant risk factor for coronary vasospasm is a. poor diet b. family history c. obesity d. smoking (correct)	50 (3)	100 (6)
4. Coronary vasospasm has been associated with a. hypertension, hypercalcemia b. hyperthyroidism, magnesium deficiency c. hyperlipidemia, hypertension d. hypothyroidism, hypernatremia	33 (2)	100 (6)
5. The classic EKG finding associated with coronary vasospasm is a. inverted T waves b. ST segment depression c. ST segment elevation (correct) d. peaked T waves	50 (3)	83 (5)
6. Patients with coronary vasospasm often report symptoms a. occurring at work b. occurring early in the morning (correct) c. occurring after meals d. occurring in the afternoon	67 (4)	100 (6)
7. Coronary vasospasm has been associated with use of a. acetaminophen b. decongestants (correct) c. NSAIDs d. antihistamines	17 (1)	100 (6)
8. Patients with coronary vasospasm may experience a. chest pain b. myocardial infarction c. arrhythmias d. all of the above (correct)	100 (6)	100 (6)

Table 10: Continued

9. In which of the following patients would you suspect coronary vasospasm/ a. a 72 year old man with a history of hypertension and hyperlipidemia who presents with exertional chest pain b. a 54 year old woman with a history of type I diabetes who presents with a “burning” pain in the center of her chest one hour after dinner c. a 36 year old man with no medical history who presents with dizziness and chest pain occurring early in the morning and unrelated to activity (correct) d. a 47 year old man with a history of obesity and hypertension who presents with occasional “stabbing” chest pains throughout the day	67 (4)	100 (6)
10. A patient with coronary vasospasm is most likely to be discharged with a prescription for a /an a. beta blocker b. ace inhibitor c. calcium channel blocker (correct) d. anti-arrhythmic	17 (1)	67 (4)
11. Risk for coronary vasospasm may have a genetic component. a. true (correct) b. false	83 (5)	100 (6)
12. Coronary vasospasm has been associated with fatal arrhythmias. a. true (correct) b. false	100 (6)	100 (6)
13. Acute coronary vasospasm can be appropriately treated with nitroglycerin. b. true (correct) c. false	67 (4)	100 (6)
14. Cardiac arrhythmia is sometimes the only presenting symptom of coronary vasospasm. a. true (correct) b. false	83 (5)	100 (6)
15. Coronary vasospasm is most often seen in middle aged women. d. true e. false (correct)	83 (5)	67 (4)

As demonstrated in the above table, all questions, with the exception of the last, increased in the percentage of participants that answered correctly following review of the teaching slides. The overall median score within this group increased from sixty-one to ninety-three percent; a difference of thirty-two percentage points.

Evaluation

Of the twenty-nine participants, twenty-seven of them completed the requested evaluation. The results of this evaluation are presented in the following table.

Table 11: Participant Teaching Project Evaluation

Question	Not at All (1)	A Little (2)	Quite a Bit (3)	Very Much (4)	Average Rating
Was the program well organized?	0	0	27%	73%	3.73
Was the program effective in meeting the first objective stated: participants will be able to successfully describe risk factors and common presentations of patients with coronary vasospasm?	0	0	42%	58%	3.58
Was the program effective in meeting the second objective stated: participants will be able to successfully analyze patient characteristics and identify those signs and symptoms consistent with coronary vasospasm?	0	0	41%	59%	3.59
Was the program effective in meeting the third objective stated: participants will be able to identify and implement appropriate nursing interventions for the management of patients with coronary vasospasm?	0	4%	46%	50%	3.46
Did the objectives relate to the overall program?	0	0	33%	67%	3.67
Were the teaching aids appropriate and effective?	0	0	38%	62%	3.62
Was the method of delivery effective?	0	0	37%	63%	3.63
Was bias or conflict of interest present?	71%	4%	13%	12%	1.67

There was also space provided within the evaluation for comments and suggestions for improvement. Six participants wrote comments. Five of these comments were positive and encouraging as follows: “great review”, “good power point simple and easy to understand”, “well done I was a total dope about vasospasm prior to this education process thank you, great presentation”, and “I learned a lot”. There was one comment concerning technical difficulty as follows: “at start of program the file page to open programs popped up at numerous times when the file was already opened.”

The space reserved for suggestions for improvement contained five responses. One of these was positive and stated “I really like this because it is accessible to everyone, easy to accomplish and takes little time.” Another of the comments was neutral and simply stated “none” while three suggestions for improvement included: “in the tests, there are duplicate questions listed in the answers”, “would be nice to have more feedback on the pre and post tests”, “double questions are repetitive; otherwise great job and good information to know.”

Summary

The teaching project was made available to all departments within the regional acute care hospital. Registered nurses from all desired departments, with the exception of the emergency room, participated in this project. Results were analyzed as based upon the overall group and the nurses’ primary departments. Additional information obtained included the number of years in acute care nursing as well as recent completion of continuing education courses. Participants were also asked to evaluate the teaching

project in general by means of a rating scale with additional space available for comments and suggestions for improvement. This data was compiled as well to demonstrate average scores from the rating scale.

EVALUATION

The development of this teaching project included a literature review and related analysis, followed by the compilation of consistent themes including risk factors, environment, EKG changes, medical and nursing management and the creation of the teaching materials for this project including the slide presentation and evaluation tools. The overall teaching project was then made available to all nursing staff within a regional hospital, and was utilized by twenty-nine registered nurses practicing in a six departments within the facility. Analysis of the data provided in the pre and post tests from the twenty-nine participants demonstrated a possible increase in knowledge following completion of the teaching project slides.

The design, data collection methods, and evaluation of data inherently contain strengths and limitations. The results of this teaching project also resulted in implications for nursing practice, education, and research.

Strengths of Teaching Project

Strengths of this teaching project are present in the design, data collection, and evaluation of results. These are discussed in greater detail.

Design

The teaching slides and evaluations for this project were developed by the writer for the purpose of this activity. Through this process, the writer was able to evaluate the wealth of information found in the literature and target specific learning objectives

necessary for the provision of the nursing process. Slides and evaluations were then tailored accordingly to meet those stated objectives. This consolidation of information into concise learning objectives can increase learner motivation and lead to attainment of the stated learning objectives (Lim & Kim, 2003).

The target population for this teaching project was registered nurses employed within the acute care setting with a representative sample from one regional hospital. Characteristics of adult learners were taken into consideration in the design of the activities for this project. Cercone's (2008) recommendations for the design of online learning activities, intended for adult participants, were utilized in this project. These recommendations included basic characteristics such as consistent bold colored fonts, clear menu options with ease of navigation through the material, and a variety of media to optimize different learning styles. The design of the teaching project contained another option intended for adult learners; allowing participants to move through the material without sequence or time restrictions, thereby giving participants opportunity to master the information prior to moving forward to the next activity.

Data Collection

The teaching project was made available over the online learning system already in place within a regional hospital. This learning system made available all components of the teaching project, allowing participants to access and completes the program as able during lulls on their shift. Staff was notified of its existence through staff meetings, flyers were placed in lounge areas, and by word of mouth. Delivery of the teaching project to participants in this fashion was cost efficient for the facility, eliminating the need to pay

instructors to present the material, grade examinations, or maintain records of completion as the online system is designed to meet these needs independently (Nelson, 2008).

Evaluation

The pre and post test scores are evaluated for the median, mean, and range of each department group. Questions are addressed individually to evaluate the percentage increase in correct answers following completion of the teaching slides, allowing for evaluation of specific concepts as demonstrated by individual questions. Participants in this teaching project were given the opportunity to leave feedback by means of a rating scale as well as through space for written comments and suggestions.

Limitations of Teaching Project

Limitations to this teaching project are present in the design, data collection, and evaluation of results. These are presented below.

Design

The teaching project slides and evaluation were developed by the writer for the purpose of this activity and have not been tested for reliability or validity. This limited the ability to generalize the results of this teaching project to other registered nurses working in other areas. For the purpose of continuing education and evaluation of pre and post test scores in the selected regional hospital, documented validity and reliability is not necessary, however it is important in any situation and if present, would have added to the significance of the conclusions of this project. Demonstrated reliability and validity

would be required to perform an experimental research study to evaluate nurses' knowledge before and after a teaching intervention.

Data Collection

During the data collection process for this teaching project, the material was made available to all nursing staff within a regional hospital. The delivery of the project over the online learning system may limit some participants including those who may be uncomfortable utilizing technology or who are computer illiterate (Nelson, 2008). The computerized learning system, used for delivery of the teaching project, has been available and used for three years in the regional hospital for required annual continuing education. In addition, the hospital offers monthly classes at no charge for employees who wish to further their computer skills.

There are some persons who, based upon their own experiences, learning styles, and preferences, feel more comfortable in a face to face situation and, as a result, have increased motivation for learning in a classroom environment rather than with computer technology. In order to minimize this limitation, these individuals could be assisted through the use of diversified media and supportive delivery techniques such as lack of time or sequence restrictions and immediate feedback on evaluations (Lim & Kim, 2003; Nelson, 2008; Phillips, 2005). This limitation could also be minimized within a group of individuals through alterations of future programs based upon feedback given on the final project evaluation.

Evaluation

Analysis of the results of the project demonstrated the highest response rates from the medical and intermediate care nursing units. The intensive care and cardiac catheterization nursing units provided fewer responses. There were no respondents from the emergency department. The lack of participation from these units specifically limits the overall data evaluation. Future data collection should target these departments.

In addition, data was collected from one regional hospital, thereby limiting the results to one geographical area and yielding twenty-nine participants. A statistical power analysis was not completed to determine the number of participants required to determine statistical significance. This was not necessary for the evaluation of the teaching project within this facility, but would be needed in the event of a research study.

The final area of limitation within this teaching project lies in the analysis and evaluation of the acquired data. While the data were evaluated for the mean and range of scores within departments and percent increase in the scores for individual questions, a statistical analysis was not completed to determine if this increase is significant. This was not required by the facility for the implementation, delivery, and evaluation of the teaching project but would have added to the significance of the findings of this project and would be necessary for future research based on the investigation of nurses' knowledge in this area, and the efficacy of a teaching intervention.

Implications for Nursing Practice

The purpose of this teaching project was to alter nursing practice by increasing the knowledge of signs, symptoms, risk factors, medical and nursing management of patients with coronary vasospasm in those responsible for providing care to individuals suffering from this condition. This increase in awareness and knowledge leads to optimal patient outcomes and opportunities to provide education to patients and families (Hardin & Kaplow, 2005). Review of the pre test scores in all units and, specifically, in units typically charged with the care of patients admitted with angina pectoris revealed a poor baseline understanding of coronary vasospasm, its presentation and management.

The synergy model for patient care describes clinical inquiry and judgment as nurse competencies necessary for the provision of care (Hardin & Kaplow, 2005). Nursing practice is constantly evolving and persons within this profession are responsible for maintaining adequate knowledge for the delivery of quality patient care. This can be accomplished through review of professional journals and attendance of opportunities for continuing education.

Implications for Nursing Education

Review of the pretest scores suggest that baseline knowledge of nursing assessment and treatment of patients with coronary vasospasm, possessed by the registered nurses in the acute care setting, is not adequate. However, it may not be practical, due to time constraints for nursing education even at the baccalaureate level, to be expected to cover every possible illness and its' associated nursing interventions. For

topics such as these, continuing education for nurses working with patients presenting with such symptoms is appropriate. Opportunity for such continuing education is the responsibility of managers and clinical staff educators employed within individual facilities.

Many nurses, working within specialized units such as intensive care, cardiac catheterization, or emergency have specific certifications in addition to their registered nurses licensure that better qualify them for these specific types of nursing care. These certifications require additional annual continuing education. It is through this requirement that education regarding patients with coronary vasospasm could be presented either through an opportunity in a nursing journal for continuing education units or through a large online database of courses.

Implications for Nursing Research

The results of this teaching project demonstrate preliminary findings suggestive of a need for further research and development of a continuing education module that could be utilized for nurses presently in practice to increase knowledge of coronary vasospasm. This would require completion of a large research project that would prove the reliability and validity of a teaching intervention. Once the research is completed, data collection with associated statistical analysis could be completed to demonstrate an increase in nursing knowledge of the risk factors, signs, symptoms and management of patients with coronary vasospasm.

Summary

Within the registered nurse sample that participated in this teaching project, post teaching test scores were improved and teaching objectives were met. This demonstrates incremental success in increasing the knowledge of signs, symptoms, risk factors, and management of patients with coronary vasospasm possessed by registered nurses within this facility.

The attainment of this goal within this teaching project and facility is encouraging and supports the notion that further investigation and work are needed to ensure the results reported in this project are reproducible and significant. Once documented, the teaching intervention could then be made available as a continuing education module for nurses working in settings where they may come into contact with patient suffering from coronary vasospasm.

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APPENDICES

APPENDIX A

PRE/POST TEST

1. Primary Department
 - a. medical
 - b. surgical
 - c. intermediate care
 - d. intensive care
 - e. emergency
 - f. cardiac catheterization lab
 - g. other

2. Years in nursing
 - a. less than 1
 - b. 1 to 5
 - c. 6 to 10
 - d. 11 to 15
 - e. 15 to 20
 - f. greater than 20

3. Number of education courses completed in past six months
 - a. less than 3
 - b. 3 to 6
 - c. 6 to 12
 - d. greater than 12

4. Coronary vasospasm is caused by
 - a. a buildup of plaque on the internal artery wall
 - b. electrolyte imbalances
 - c. an abnormal contraction of a coronary artery
 - d. development of a thrombus

5. Coronary vasospasm occurs most often
 - a. at the initiation of strenuous activity
 - b. during periods of rest
 - c. following strenuous activity
 - d. unrelated to activity level

6. The most significant risk factor for coronary vasospasm is
 - a. poor diet
 - b. family history
 - c. obesity
 - d. smoking

7. Coronary vasospasm has been associated with
 - a. hypertension, hypercalcemia

- b. hyperthyroidism, magnesium deficiency
 - c. Hyperlipidemia, hypertension
 - d. hypothyroidism, hypernatremia
8. The classic EKG finding associated with coronary vasospasm is
- a. inverted T waves
 - b. ST segment depression
 - c. ST segment elevation
 - d. peaked T waves
9. Patients with coronary vasospasm often report symptoms
- a. occurring at work
 - b. occurring early in the morning
 - c. occurring after meals
 - d. occurring in the afternoon
10. Coronary vasospasm has been associated with
- a. acetaminophen
 - b. decongestants
 - c. NSAIDs
 - d. antihistamines
11. Patients with coronary vasospasm may experience
- a. chest pain
 - b. myocardial infarction
 - c. arrhythmias
 - d. all of the above
12. In which of the following patients would you suspect coronary vasospasm?
- a. a 72 year old man with a history of hypertension and hyperlipidemia who presents with exertional chest pain
 - b. a 54 year old woman with a history of type one diabetes who presents with a “burning” pain in the center of her chest one hour after dinner
 - c. a 36 year old man with no medical history presents with dizziness and chest pain occurring early in the morning and not related to any activity
 - d. a 47 year old man with a history of obesity and hypertension who presents with occasional “stabbing” chest pains throughout the day
13. A patient with coronary vasospasm is most likely to be discharged with a prescription for a/an
- a. beta blocker

- b. ace inhibitor
- c. calcium channel blocker
- d. anti-arrhythmic

14. Risk for coronary vasospasm may have a genetic component.

- a. true
- b. false

15. Coronary vasospasm has been associated with fatal arrhythmias

- a. true
- b. false

16. Acute coronary vasospasm can be appropriately treated with nitroglycerin.

- a. true
- b. false

17. Cardiac arrhythmia is sometimes the only presenting symptom of coronary vasospasm.

- a. true
- b. false

18. Coronary vasospasm is most often seen in middle aged women.

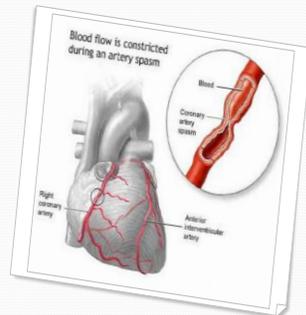
- a. true
- b. false

APPENDIX B

TEACHING PROJECT SLIDES

Coronary Vasospasm: Signs, Symptoms, Risk Factors, and Nursing Management

Jessica Glover, R.N., B.S.N.



Learning Objectives

- Participants will be able to successfully describe risk factors and common presentations of patients with coronary vasospasm.
- Given a patient scenario, participants will be able to successfully analyze patient characteristics and identify those signs and symptoms consistent with coronary vasospasm.
- Participants will be able to identify and implement appropriate nursing interventions for the management of patients with coronary vasospasm.

Activity to Complete First

- Access and complete the pre-test by clicking on the link below
 - Demographics
 - [Pre-Test.doc](#)

Coronary Vasospasm

- An abnormal contraction of an epicardial coronary artery resulting in myocardial ischemia
- Can be lethal if not recognized as conventional interventions within the cardiac catheterization lab are not helpful

Other Causes of Chest Pain

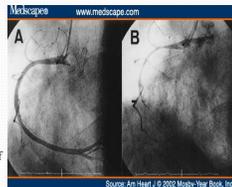
- Musculoskeletal
- Pulmonary
 - Pneumonia
 - Pulmonary embolism
- Gastrointestinal
 - Indigestion
- Cardiac
 - Atherosclerosis
- Psychological

Incidence

- Coronary vasospasm affects men and women equally though typically it is middle-aged to elderly men and post-menopausal women.
- Has been shown to occur more frequently in persons of Asian descent though this may be due to genetic variation or increased cigarette smoking within this population.
- Persons with known coronary vasospasm have demonstrated incidence rates of myocardial infarction of 20-30% and life threatening arrhythmias at 5-10%.

Incidence cont.

- This photograph depicts coronary vasospasm as seen during angiography
- Of those who undergo cardiac catheterization, one third will demonstrate no atherosclerotic lesions and a normal angiogram
 - Of this group, two thirds will continue to report episodes of chest pain



Risk Factors for Coronary Vasospasm

- Smoking!!!
 - This is the largest risk factor and the only one shared with atherosclerotic coronary artery disease
- Medications
- Physiological risk factors
- Genetic predisposition



Medications That May Precipitate Coronary Vasospasm

- Catecholamines
- Parasympathomimetic agents
- Anticholinesterase
- Serotonin
- Histamine
- Beta adrenergic blockers
- Cocaine
- Alcohol
- Nicotine
- Withdrawal from chronic nitroglycerin

Case Studies

- One case reported in professional literature describes a healthy 32-year-old man who suffered a myocardial infarction from coronary vasospasm approximately 45 minutes following ingestion cold medicine containing pseudoephedrine.
- Other cases of coronary vasospasm have been reported in the literature occurring in healthy individuals while under anesthesia some of which leading to reversible arrhythmias and some leading to sudden cardiac death.

Physiological Risk Factors

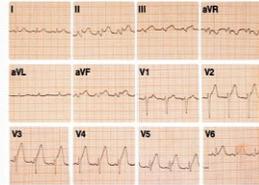
- Hyperthyroidism
- Hyperventilation
- Exposure to cold
- Magnesium deficiency
- Physical or emotional stress

Characteristics of Patients with Coronary Vasospasm

- EKG changes
- Onset of chest pain
- Associated arrhythmias

EKG changes

Classic is ST segment elevation during episode of discomfort with return to baseline following resolution of pain



EKG changes

- Less often, coronary vasospasm can present with
 - ST segment depression
 - T wave inversion
 - Peaked T waves
 - R on T
 - Transient Q waves



Onset of Chest Pain

- Most often occurs at night or in the early morning
 - The pain can be very brief lasting just moments or quite prolonged remaining until treatment.
- Most often occurs while at rest
 - Some reports of coronary vasospasm during exercise have been reported though less common and may be related to a combination of atherosclerotic lesions and vasospasm.
- May be preceded by emotional distress

Associated Arrhythmias

- Arrhythmias may be the only presenting symptom in a patient with coronary vasospasm.
- There have been cases of fatal arrhythmias documented with Holter monitors, inpatient telemetry monitoring, and during cardiac catheterizations attributed to coronary vasospasm.
- These include: ventricular tachycardia, ventricular fibrillation, premature ventricular contractions, and various degrees of atrioventricular blocks.

Case Study

- One case documented involved a 46 year old man who had an automated implanted cardioverter defibrillator (AICD) following a cardiac arrest. Subsequently, he had frequent discharges of his AICD and was taken to the cardiac catheterization lab where he demonstrated ventricular tachycardia associated with spasm of the right coronary artery.

Medical Treatment

- Medications
 - Nitroglycerin for acute symptoms
 - Calcium channel blockers for prevention
 - Long acting nitroglycerin for prevention of symptoms in patients with persistent coronary vasospasm despite other therapy.

Nursing Management

- Assessment of patient and report of findings to physician
- Administration of appropriate medications
- Patient education
 - Disease process
 - Medications
 - Avoidance of risk factors
 - Prevention of future vasospasm
 - Treatment of future vasospasm

Summary

- Coronary vasospasm is often unpredictable and may present outside of the typical characteristics.
- This should be considered in any patient with chest pain, EKG changes, or arrhythmias in the face of normal coronary arteries.
- Due to the severity of the possible outcomes of coronary vasospasm recognition of this problem, appropriate interventions, and patient education are essential nursing actions.

Activities to Complete Last

- Access and complete the post-test by clicking on the link below
 - [Pre-Test.doc](#)
- Access and complete the participant evaluation for this presentation by clicking the link below
 - [Evaluation.doc](#)

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APPENDIX C

PARTICIPANT EVALUATION OF TEACHING PROJECT

Please circle the answer that best explains your feelings about this program

- 1 – not at all
- 2 – a little
- 3 – quite a bit
- 4 – very much

Was the program well organized?.....1 2 3 4

Was the program effective in meeting each objective?

- 1. Participants will be able to successfully describe risk factors and common presentations of patients with coronary vasospasm.....1 2 3 4
- 2. Given a patient scenario, participants will be able to successfully analyze patient characteristics and identify those signs and symptoms consistent with coronary vasospasm.....1 2 3 4
- 3. Participants will be able to identify and implement appropriate nursing interventions for the management of patients with coronary vasospasm.....1 2 3 4

Did the objectives relate to the overall program?1 2 3 4

Were the teaching aids appropriate and effective?1 2 3 4

Was the method of delivery effective?1 2 3 4

Was bias or conflict of interest present?1 2 3 4

Comments:

Suggestions for improvement: