

CHAPTER 2

LITERATURE REVIEW

This part provided the review of selected theoretical and empirical literature that is relevant to the area of persons awaiting CABG. The literature is organized into three sections as follows:

- 1) Nature of coronary artery disease
- 2) Nature of CABG
- 3) Living with coronary artery disease during awaiting CABG

Nature of Coronary Artery Disease

Definition of Coronary Artery Disease

Coronary artery disease [CAD] is a disease of coronary artery that usually caused by atherosclerosis or a hardening of the arteries (Morrow & Gersh, 2008). It is also known as atherosclerotic cardiovascular disease, coronary heart disease, and ischemic heart disease. CAD is a condition of narrowing or blockage of coronary arteries (the blood vessels that supply blood and oxygen to the heart). This results in reducing or cutting off blood flow to the heart's muscle (Hansson, 2005; Libby & Theroux, 2005).

Incidence and Prevalence of Coronary Artery Disease

Coronary artery disease [CAD] is a significant public health problem with the marked variations in the incidence of CAD among regions of the world, nations, and

even between regions within a country (American Heart Association [AHA], 2012; Scarborough, Wickramasinghe, Bhatnagar, & Rayner, 2011). According to the data from the WHO (2008), it is the leading cause of death and is expected to cause more than 11 million deaths in 2020. The evidence reported that nowadays the age-standardized mortality rates from CAD are declining significantly in many developed countries particularly in USA and in most countries in the European Union, but are increasing in developing and transitional countries, partly as a result of demographic changes, urbanization, and lifestyle changes (Tardif, 2010). The declining in CAD mortality rates from a better survival of CAD patients leads paradoxically to an increase in a prevalence of CAD (Waring, 2007).

Presently, CAD is not only a serious health problem in USA and the countries in European Union; it is also a severe health problem in Thailand. The statistics from the Bureau of Policy and Strategy (2012a; 2012b) shows the rapid increasing in the numbers of CAD patients from 111.13 per hundred thousand of the population in 2001 to 310.16 per hundred thousand populations in 2010. In the northern part of Thailand, specifically, the prevalence of CAD patients in 2001 increased from 140.40 per hundred thousand of the population (Bureau of Policy and Strategy, 2012a) to 312.69 per hundred thousand of the population in 2010 (Bureau of Policy and Strategy, 2012b). The prevalence and the severity of CAD problem in Thailand is reflected by the increase of the number of patients undergoing CABG, the ultimate gold treatment for persons who have severe CAD which has been observed in Thailand in the recent years. The Society of Thoracic Surgeons of Thailand (2012) reported that there were 1,731 cases underwent a CABG in 2001. The number of cases has been increased to 4,402 cases in 2011. Similar to Maharaj Nakorn Chiang

Mai Hospital, the university hospital is the majority of CABGs in the northern part of Thailand are performed has shown the increasing number of patients undergoing CABG from 124 in 2001 to 242 in 2011. Therefore, these statistics confirm the prevalence and the serious health problem of CAD which needs more concern.

Pathophysiology of Coronary Artery Disease

Atherosclerosis, the major cause of CAD, is characterized by changes in the intimal lining of artery with eventual partial or full occlusion of arterial lumen. The genesis of plaque formation is the result of complex interactions between the components of the blood and the elements forming the vascular wall. Inflammation and the endothelial injury plays a key role in the development of atherosclerosis (Hansson, 2005; Libby & Theroux, 2005; Miller, 2006).

Intact normal endothelium is more than a simple barrier between the vessel wall and the lumen of the vessel. Normally, it is nonreactive to platelets and leukocytes, as well as coagulation, fibrinolytic, and complement factors. However, the endothelial lining can be injured as a result of tobacco use, hyperlipidemia, hypertension, diabetes, hyperhomocysteinemia, and infection (e.g., Chlamydia pneumoniae, herpes) causing a local inflammatory response (Hansson, 2005).

In addition, C-reactive protein [CRP], a nonspecific marker of inflammation, is increased in many patients with CAD. Chronic exposure to even minor elevations of CRP can trigger the rupture of plaques and promote the oxidation of low-density lipoprotein [LDL] cholesterol, leading to increased uptake by macrophages in the endothelial lining (Hansson, 2005; Libby & Theroux, 2005).

Since CAD is a progressive disease that takes many years to develop. When it becomes symptomatic, the disease process is usually well advanced. To describe the

developmental stages of atherosclerosis, the major cause of CAD, the response to injury theory is usually used (Hansson, 2005). According to this theory, the developmental stages include fatty streak, fibrous plaque resulting from smooth muscle cell proliferation, and complicated lesion.

Fatty streaks, the earliest lesions of atherosclerosis, are characterized by lipid-filled smooth muscle cells. As streak of fat develop within the smooth muscle cells, a yellow tinge appears. Fatty streaks can be observed in the coronary arteries by teenage (age 15) and involve an increasing amount of surface area as the patients ages. It is generally believed that treatment that lowers LDL cholesterol may reverse this process (AACVPR, 2006; Hansson, 2005)

The fibrous plaque stage is the beginning of progressive changes in the endothelium of the arterial wall. These changes can appear in the coronary arteries by age 30 and increase with age (AACVPR, 2006). Normally the endothelial repairs itself immediately, but in the person with CAD the endothelium is not rapidly replaced, allowing LDLs and growth factors from platelets to stimulate smooth muscle proliferation and thickening of the arterial wall. Once endothelial injury has occurred, lipoproteins transport cholesterol and other lipids into the arterial intima. The fatty streak is eventually covered by collagen forming a fibrous plaque that appears grayish or whitish. These plaques can form on one portion of the artery or in a circular fashion involving the entire lumen. The borders can be smooth or irregular with rough, jagged edges. The result is a narrowing of the vessel lumen and a reduction in blood flow to the distal tissues (Hansson, 2005).

The final stage in the development of the atherosclerotic lesion, the complicated lesion, is the most dangerous. As the fibrous plaque grows, continued

inflammation can result in plaque instability, ulceration, and rupture. Once the integrity of the artery's inner wall has become compromised, platelets accumulate in large numbers, leading to thrombus. The thrombus may adhere to the wall of the artery which reduces blood flow through other arteries. Eventually, the heart muscle is not able to receive the amount of blood red oxygen as needs. Reduced or cutoff blood flow and oxygen supply to the heart muscle can result in chest pain (angina), myocardial infarction [MI], heart failure, and eventually sudden death. Moreover, the thrombus may flow through other arteries which lead to the complications such as stroke (Hansson, 2005).

Clinical Manifestation of Coronary Artery Disease

CAD typically presents as either angina or acute MI (Miller, 2006). Angina or chest pain is caused by a temporary imbalance in the supply of oxygen to a portion of myocardial and it resolves when adequate myocardial oxygen supply is restored. No permanent damage to myocardial cells results from an episode of angina (Libby & Theroux, 2005). Symptom of angina or typical symptom is a discomfort often described as dull pressure, uncomfortable ache, pain, tightness, or squeezing sensation that typically occurs in the central chest near the sternum. However, in an individual patient the symptoms may be experienced anywhere between the eye brows and the umbilicus. Symptoms may radiate typically to the left neck, jaw, axilla, or arm. Angina occurs with exertion and is relieved partly or completely by rest. Symptoms are much worse if exercise follows a meal and can be precipitated by anxiety and states of excitement (Miller, 2006). On the other hand, atypical symptoms have different characteristics and different anatomical locations. The symptoms may include progressive fatigue, shortness of breath, and diaphoresis (sweating) that are

more significant than indicated by the level of exertion. Palpitations or a rapid or slow heart rate may also accompany the angina symptoms (Miller, 2006).

For another type of clinical manifestation, an acute MI, it permanently damages the myocardial cells in the affected area. This occurs when myocardial oxygen supply to a specific area of the heart muscle is abruptly blocked or significantly reduced for several minutes or longer as a result of the atherosclerotic process (Libby & Theroux, 2005; Miller, 2006). MI may be the first manifestation of CAD that a patient experiences, or it may be the result of the progression of unstable angina. MI can be associated with total and rapid occlusion of a single coronary artery or partial occlusion of one or more arteries depriving the myocardium of adequate blood flow (i.e., oxygen and nutrients) necessary to survive. The occlusion is frequently produced by a thrombus associated with a ruptured endothelial plaque in a coronary artery that may be only 40% to 60% obstructed and causing no symptoms of coronary insufficiency before the event (Hansson, 2005; Libby & Theroux, 2005). It is now thought that an artery with an unstable plaque is likely a frequent cause of MI as well as sudden death. The primary complications of MI are: arrhythmias, postinfarction angina, and left ventricular dysfunction that results in congestive heart failure [CHF] (Miller, 2006).

CHF, the most common complication of CAD, is a condition in which the heart cannot pump enough blood to meet the body's needs. Either the heart cannot fill with enough blood or the heart cannot pump blood to the rest of the body with enough force, or sometimes both (Smeltzer & Bare, 2004). This condition typically presents three major symptoms that impact on patients' lives including exercise intolerance, shortness of breath, and fluid retention and swelling. For exercise intolerance,

patients may be unable to tolerate exercise or even mild physical exertion that they may have been able to do in the past. The ability to exercise, to do ordinary activities, even to walk at a normal pace, may be difficult or limited by feeling tired (fatigue) and having shortness of breath. However, the shortness of breath that accompanies these activities usually gets better with rest. The second symptom is shortness of breath. If patients have CHF, they may have difficult breathing (dyspnea), especially when they are active. When CHF worsens, they may feel dyspnea at rest and at night which cause them awaken at night and have to sit to get relief. In this condition, several pillows and sleeping in a recliner may help to promote a more comfortable sleep (Braunwald, Zipes, & Libby, 2001). Finally, fluid retention and swelling may occur particularly in the legs, the feet, and the ankles at the end of the day or after prolonged sitting or standing. Often, the swelling is more noticeable in the ankles or on the lower leg in the front where the bone is close to the skin. When press finger down on the skin in these areas; the indentation where the finger pressed may be visible for a few minutes. This is called pitting edema (Smeltzer & Bare, 2004). If persons with CAD have following symptoms, it means that more advance treatment need to be used.

Treatment of Coronary Artery Disease

Treatments for CAD aim to improve the patient's quality of life by treating or relieving chest pain (angina) and/ dyspnea symptoms, and to prolong survival. Treatments vary according to the severity of the disease, the location of blockages in the blood vessels, the presence of cardiac risk factors (e.g. abnormal cholesterol profile or hypertension), and the overall health of individual patients (Waring, 2007). Treatment options for CAD are risk factors modification, medications, medical

interventional procedures (e.g. percutaneous transluminal coronary angioplasty [PTCA] or angioplasty with stent, artherectomy), and surgical interventional procedures (e.g. coronary artery bypass grafting [CABG], transmyocardial laser revascularization [TMLR] (American Association of Cardiovascular and Pulmonary Rehabilitation [AACVPR], 2006). Risk factors modification, medications, and medical interventional procedures are tried first depending upon the progression of the disease. If those following treatment options do not work, CABG is then considered (Simoons & Windecker, 2010). Detail of each treatment is presented as follows:

Risk Factors Modification

The first crucial step is to address coronary risk factors that have contributed to the development of atherosclerotic disease and manage those risk factors. Risk factor modifications include: stop smoking; decrease lipid and cholesterol intake; control high blood pressure; control blood sugar; increase physical activity; maintain ideal body weight; and reduce stress (Roitman & LaFontaine, 2006). Ways of risk factor modification are presented as follows:

Stop smoking. Smoking is directly related to an increased risk of the heart attack and its complication. CAD patients who keep on smoking have a 43% greater chance of dying from a heart attack than those who stop smoking (Goldenberg, Jonas, Tenenbaum, Boyko, Matetzky, Shotan, et al., 2003).

Decrease lipid and cholesterol intake. A high-fat diet can contribute to increased fat content in the blood, thus leading to heart attack. A low-fat diet, exercise, and medications can help in decrease lipid and cholesterol.

Control high blood pressure. High blood pressure can damage the lining of coronary arteries and lead to severe coronary artery disease. Blood pressure should be checked on a regular basis. Controlling sodium in diet, exercise, and medications can control high blood pressure in this group of patients.

Control blood sugar. High blood sugar is linked to the progression of CAD. High blood sugar can be controlled through monitoring blood sugar, diet, exercise, and medications.

Increase physical activity. Regular physical activity can lower many CAD risk factors including LDL-cholesterol, high blood pressure, and excess weight. Increased physical activity also can lower risk for diabetes and raised the level of HDL-cholesterol.

Maintain ideal body weight. When patients are overweight, they are at risk in increasing the risk of high blood pressure, high cholesterol level, and diabetes.

Reduce stress. An emotionally upsetting is the common trigger for a heart attack, particularly anger. Exercise can help to relieve stress in this group of patient.

Medications

In addition to risk factor modification, persons with CAD have to adequately treated with medications. The medications commonly used for CAD treatment include nitrates, beta-blockers, calcium channel blockers, aspirin or antiplatelets, and angiotenzin converting enzyme [ACE] inhibitors (Libby, Braunwald, Bonow, Mann, & Zipes, 2008).

Nitrates. These medications are the most common vasodilator used for acute cases of angina. It works to dilate or widen the coronary arteries, increasing blood flow to the heart muscle and to relax the veins, lessening the amount of blood that

returns to the heart from the body. This combination of effects decreases the amount of work for the heart (Miller, 2006). Nitrates can be taken sublingually; by oral spray, transdermal patches, or orally. In case of acute angina, the sublingual medication and mouth spray may more quickly relieve symptoms.

To use nitrates especially nitroglycerine, strictly follow the directions and instructions given by healthcare provider is important. Patients will be informed that this medication must be kept with them at all times in a dark container. It should be kept away from heat or moisture. Expiration date on the container must be checked. And, once the container is opened, it must be replaced every 6 months.

Beta-blockers. These medications are a class of medications that relax the blood vessels and slow the heart rate. It thereby improves blood flow to the heart, decreases systolic blood pressure, decreases myocardial contractility, and decreases symptom of angina. The decrease in heart rate and myocardial tension increases the diastolic coronary perfusion time and improves distal coronary perfusion. This combination of decreased cardiac work and increased myocardial perfusion helps to control angina symptoms.

Calcium channel blockers. These medications are frequently beneficial for relief of angina when given in combination with beta-blockers in the sustained action form. These vasodilators are helpful in controlling angina, arrhythmias and hypertension (Miller, 2006).

In addition to anti-anginal drugs or anti- ischemic drugs, these medications are also given to prevent MI or further MI including aspirin or antiplatelets, beta-blockers, and angiotenzin converting enzyme [ACE] inhibitors. Aspirin or antiplatelets such as clopidogrel are used to reduce the risk of re clotting at the

atherosclerotic lesion. Beta-blockers are also used to reduce likelihood of arrhythmias or to stabilize myocardium. Finally, ACE inhibitors are used to reduce remodeling of the damaged ventricle and help to prevent the development of ischemic cardiomyopathy (Miller, 2006).

Medical Interventional Procedures

Medical interventional procedures are demonstrated as revascularization procedure. The interventional cardiology procedures include an angioplasty and stent replacement, artherectomy, and transmyocardial lazer revascularization. Detail of each procedure are presented as follows:

Percutaneous transluminal coronary angioplasty [PTCA] or angioplasty with stent). In this procedure, a long thin catheter is inserted into the narrowed part of artery. A wire with a deflated balloon is passed through the catheter to the narrowed area. The balloon is then inflated, compressing the deposits against the artery walls, thus allowing more blood to flow through the widened vessel (AACVPR, 2006). However, a major problem with this approach is the gradual re-closure of the vessel (restenosis). Recently, the introduction of stents has somewhat helped in solving this problem. These stents are implanted in the artery after angioplasty. They hold the plaque against the wall and help to prevent the vessel from closing again. Latest stents, known as drug eluting stents which have been coated with special drugs can also help to reduce restenosis (Libby, Braunwald, Bonow, Mann, & Zipes, 2008).

Atherectomy. It is another catheter-based procedure, in this procedure a special catheter is guided into the blocked coronary artery. The catheter is equipped with a blade that cuts away the soft plaque deposits, or grinding burr that pulverizes harder, calcified plaque (AACVPR, 2006).

Transmyocardial laser revascularization [TMLR]. This procedure sometimes may consider as the medical procedures. It involves the use of a laser to create tiny channels in the lower left chamber of the heart (the left ventricle), which may increase blood flow within the heart. While the heart is still beating, the surgeons use the laser to make 20 to 40 tiny (one-millimeter-wide) channels through the oxygen-deprived heart muscle and into left ventricle. These channels give a new route for blood to flow into the heart muscle, which may reduce pain of angina. TMLR is only used for the patients who do not respond to other treatments such as medicines, angioplasty, or CABG (AACVPR, 2006).

Nature of Coronary Artery Bypass Grafting

Persons awaiting CABG are persons with severe progression of CAD. They are unable to control the severity of CAD with medicine and also with the percutaneous transluminal coronary angiography [PTCA]. They have the stenosis of left main coronary artery, or have triple vessel disease (the stenosis of left main coronary artery, left anterior descending coronary artery, and right coronary artery disease), and/ have poor function of the pumping chamber of the heart (left ventricle). In addition, patients usually have unstable angina, and some demonstrate having acute myocardial infarction with cardiogenic shock (Aupart et al., 2003; Nawarawong, 2000).

Definition of Coronary Artery Bypass Grafting

CABG is a procedure for compensating the pathology of CAD. It involves creating new arteries to provide sufficient blood to myocardium by use of other blood vessels (i.e. saphenous vein, internal mammary artery, radial artery) as conduits to bypass the

obstructions in the patient's coronary artery (Mullany, 2003). Patent bypass grafting of all significant atherosclerotic lesions usually alleviate all symptoms associated with myocardial ischemia. Consequently, receiving this procedure, symptoms of CAD such as chest pain and dyspnea will be relieved and the longevity will be improved.

Indications for Coronary Artery Bypass Grafting

Indications for CABG are primarily considered symptoms, coronary anatomical pathology, and left ventricular function. The American College of Cardiology and the American Heart Association (2004) has provided Guideline Update for CABG which can be summarized as follows (Eagle, Guyton, Davidoff, Edwards, Ewy, Gardner, et al., 2004):

Indications for CABG in asymptomatic or mild angina

- Significant left main coronary artery stenosis
- Left main equivalent (significant $\geq 70\%$ stenosis of proximal LAD and proximal circumflex arteries)
- Three vessel disease
- Proximal LAD stenosis with one or two vessel disease and either ejection fraction (EF) $< 50\%$ or extensive ischemia by noninvasive study

Indications for CABG in stable angina

- As for CABG in asymptomatic or mild angina
- One or two vessel disease with out significant LAD stenosis but with a large area of viable myocardium
- Disabling angina despite medical therapy

Indications for CABG in unstable angina/Non-ST segment elevation MI

- Significant left main coronary artery stenosis

- Left main equivalent
- Proximal LAD stenosis with one or two vessel disease
- Ongoing ischemia not responsive to maximal non-surgical therapy

Indications for CABG in ST-segment elevation MI

- Ongoing ischemia not responsive to maximal non- surgical therapy
- Mechanical complications of acute MI: infarct ventricular septal defect, mitral valve insufficiency

- Cardiogenic shock
- Life threatening ventricular arrhythmias

Indications for CABG in poor left ventricular function

- Significant left main coronary artery stenosis
- Left main equivalent
- Proximal LAD stenosis with 2 or 3 vessel disease

Indications for CABG in life threatening ventricular arrhythmias

- Caused by left main coronary artery stenosis
- Caused by three vessel disease

Indications for CABG after failed percutaneous coronary angioplasty

- Ongoing ischemia or threatened occlusion with significant myocardium at risk
- Hemodynamic compromise

Indications for CABG with previous CABG

- Disabling angina despite optimal non-surgical therapy
- Prior CABG without patent bypass grafts but with class I indications for surgery for native vessel coronary artery disease

Even though there are great benefits obtained from the CABG surgery, however, demand for this operation has outstripped capacity due to limited facilities. Long queues for the procedure are now in common in many countries. Therefore, this group of patients has to wait for the surgery and face many problems and difficulties during this critical period.

Living with Coronary Artery Bypass Grafting During Awaiting CABG

Encountered Problems during Awaiting CABG

The waiting time for CABG surgery is considered critical period and life-crisis situation for persons awaiting CABG (Lindsay, Smith, Hanlon, & Wheatly, 2000). It is negative as it is a virtue of the stress encountered by waiting an intermediate length of time (Jonsen, Athlin, & Suhr, 2000). According to the literature review, the long waiting time produces several problems for persons awaiting CABG including physical, psychological, and social problems. Detail of each problem is given below.

Physical Problems

Living with severe CAD during preoperative waiting period had negative consequences. During this period, there are several physical symptoms appearing among persons awaiting CABG such as chest pain, dyspnea, fatigue etc. As reported by many studies, the most prominent physical symptom during waiting for CABG was chest pain (Arslanian-Engoren, 2005; Bengtson, Herlitz, Karlsson, & Hjalmarson, 1996; Bunkong, 2009; Canto, Goldberg, Hand, Bonow, Sopko, Pepine, et al., 2007; Jonsdottir & Baldursdottir, 1998). According to Bengtson et al. (1996), chest pain was reported as the worst symptom for 44% of persons awaiting CABG. This symptom limited their activities of daily living and also was reported as a major

disruptive symptom during awaiting period. This supported by the study of Fitzsimons, Parahoo, and Stringer (2000) which conducted interviews with 70 patients waiting for CABG in Northern Ireland. In this study, many patients expressed that chest pain was a major difficulty in their lives which restricted their physical activity and prevented them from leading what they considered to be a normal lifestyle. The pain also acted as a reminder of patients' heart problem. Patients reported that when they felt a pain they often recalled the severity of their illness and the fact that they were waiting for a surgery. In Thai context, the study of Bunkong (2009). which surveyed symptom experience in 60 southern Thai patients waiting for CABG, found that chest pain was reported by 80% of patients. It was the most common symptom reported among patients during waiting for CABG.

Besides chest pain, persons awaiting CABG also experienced other physical symptoms. As reported by Jonsdottir and Baldursdottir (1998) which studied in 88 people awaiting CABG in Iceland, the most common other symptoms were fatigue, shortness of breath, palpitation, and sleep disturbance. While in Thailand, Bunkong (2009) found that the common other physical symptoms were fatigue/weakness, indigestion/abdominal distension, and dyspnea/shortness of breath/difficult breathing. These symptoms were reported as the difficulties that disrupted their lives during awaiting period.

Moreover, worsening of symptoms or adverse cardiac events such as unstable angina or myocardial infarction also upgrade the need of more urgent intervention that induce the patients to undergo hospitalization before surgery and readmit with the cardiac event during the time of waiting for CABG (Ray, Buth, Sullivan, Johnstone, & Hirsch, et al., 2001). This fact was supported by a study of Jackson, Doogue, and

Elliott (1999), who reported that while waiting for CABG, patients had cardiac events including non-fatal myocardial infarction and readmission with unstable angina. Similarly, Koomen, , Hutten, Kelder, Redekop, Tijssen, and Kingma (2001) also found patients waiting for CABG suffered from myocardial infarction and unstable angina requiring immediate hospitalization. Therefore, being in the waiting list for CABG indicates a risk of hospitalization and cardiac readmission.

Psychological Problems

Having severe CAD while awaiting CABG had negative consequences. Majority of studies reported anxiety among patients awaiting CABG. Underwood, Firmin, and Jehu (1993) found that over a quarter of the 68 patients they studied, on a CABG waiting list, experienced clinically significant anxiety. This fact was supported by Jonsdottir and Baldursdottir (1998) which indicated that 60.9% of patients in their study reported an increase in anxiety during this period. Lindsay et al. (2000) which interviewed 214 patients undergoing elective CABG also revealed problem of anxiety while awaiting CABG. Patients expressed that the waiting time is the worst problem which gives problem of thinking and worrying. Similarly, Fitzsimons et al. (2000) discovered that anxiety was one of the themes that emerged from their qualitative study of 70 patients awaiting CABG. The participants in this study reported that they worried about the threat their heart problem posted to their lives, and about the impending operation. Screeche-Powell and Owen (2003) also revealed fear/anxiety as the strongest theme identified by patient waiting for CABG. In this study, fear/anxiety whether they would survive the operation and the possibility of their health deteriorating during the waiting period were reported as the overriding fear/anxiety in the patients awaiting CABG.

In-depth interviews conducted by Fitzsimons et al. (2000) revealed uncertainty regarding how long they would have to wait for CABG surgery was a major difficulty for participants. Many patients felt that their lives were on hold, and that they could not make plans for the future as a result. This study was supported by Screeche-Powell and Owen (2003) that uncertainty about issues relating to their health, surgery or treatment plans, and when the operation would be done was also reported as the strongest theme identified. On the other hand, fear of death during and after the anesthetic-surgical procedure and fear of suffering irreversible damage were also expressed as the sources of uncertainty in persons awaiting CABG (Lindsay et al., 2000). These were confirmed by study of Bunkong (2009) which was found that the common psychological symptom occurrences during waiting for CABG were fear/fright (48.3%), stress/anxiety (48.3%), and uncertainty (46.7%).

Moreover, Jonsdottir and Baldursdottir (1998) found that most patients (86.6%) reported that they were stressed, with 28.4% reporting that they were experiencing severe stress during this pre-operative wait. Additionally, the following psychological symptoms were reported in this study: increased impatience (40.4%), irritability (39.2%), hopelessness (29.8%), and depression (21.7%). Above psychological symptoms reflected the negative consequences of waiting on persons awaiting CABG.

Social Problems

Waiting for CABG has negative effects mostly on the daily lives and jobs. Jonsdottir & Baldursdottir (1998) found that changes in employment were reported by the subjects. Only 12.5% were not employed at the time of their diagnosis, but this had increased to 44.4% during the waiting period. This problem impacts on their

financial status. Moreover, as studied by Fitzsimons et al. (2000), many participants disclosed that during waiting period their family relationships had deteriorated because of their illness, this was principally as a result of their roles and responsibilities being undermined. Some participants also stated that their illness restricted their social contacts and affected their ability to socialize, which resulted in feeling lonely and isolated during waiting period.

In conclusion, waiting time for CABG is an important period that can produce adverse events and even death. Patients waiting for CABG experienced a wide range of physical, psychological, and social problems that disrupt their lives and affect their quality of life.

Management of Problems during Awaiting CABG

According to the literature review, information related to management of persons awaiting CABG is limited. Only one study of Bunkong (2009) reported data related to the management during waiting for CABG in the Southern of Thailand. From this study, the management of persons awaiting CABG can be classified into three groups in regard to their situations during awaiting CABG: 1) physical management; 2) psychological management; and 3) social management.

Physical Management

Physical management during awaiting CABG mainly focused on physical symptom i.e. chest pain, fatigue/weakness, shortness of breath/dyspnea, and indigestion/abdominal distension. The management of each symptom was described as follow:

For symptom of chest pain, the most prominent symptom in persons awaiting CABG, Bunkong (2009) found that most of subjects (79.1%) used pharmacological

management strategy to manage this symptom such as taking Isosorbide dinitrate [ISDN]. In addition, non-pharmacological management strategy was also used to manage the symptoms such as resting, chest thumbing, massage/rubbing or moving the arms. Only few subjects used the combination of both methods.

Regarding fatigue/weakness, Bunkong (2009) found that all subjects used non-pharmacological strategies to manage this symptom and the three common strategies were resting (82.5%), waiting and seeing (12.5%), and consuming sweetie and sweet water (5%). For shortness of breath/dyspnea, Bunkong (2009) revealed that most subjects (80%) used non-pharmacological strategy. The highest number of subjects with shortness of breath/dyspnea (40%) usually used relaxation technique (resting, deep breathing, and meditation), followed by positioning (20%), and waiting and seeing (20%). Lastly, for managing indigestion/abdominal distension, Bunkong (2009) also found that both pharmacological and non-pharmacological management strategies were used. However, most of subjects (67.7%) used pharmacological strategies such as taking laxative, antacid, soothing medicine (*Ya-Hom*), and curcuma (*Ka-Min-Chan*). In addition, the rest of subjects (32.3%) used non-pharmacological strategies such as belching, abdominal compressing, waiting and seeing, and avoiding gas-inducing diet.

Psychological Management

Patients waiting for CABG surgery have been reported to experience anxiety and depression, which have been shown to be related to increase severity of chest pain and dyspnea (Bengtson et al., 1996; Underwood et al., 1993), and increased myocardial ischemia and infarction. In addition, Bengtson et al. (1996), and Staples and Jeffrey (1997) found that uncertainty and fear were more disturbing for waiting

patients than their angina. Therefore, psychological management was employed in persons awaiting CABG.

Bunkong (2009) found that religious coping (both Buddhist and Muslim) was usually used when patients waiting for CABG confronted psychological symptoms including stress or anxiety, fear or frighten, uncertainty, and sad. Patients usually performed the religious activities to cope with their psychological symptoms by holding onto religious principle for a cure and a longer life. Religious coping was appraised with reference to the individual, culture, beliefs, and religion. In Bunkong (2009), Buddhist patients often used accepting or resigning (*Tham-Jai* or *Plong*), prayer or reading dharma book, meditation, and going to temple while they were confronting with psychological problems. Integrating Buddha's teaching into their lives was a crucial way of patients' to rearranging their life for alleviating their suffering from inevitable and uncontrolled events. Following Buddha's teachings, the patients have well adjusted to living with people with happiness and have the right understanding of the truth of human life. These findings support culture and values notions about Buddhist concepts and religious ritual. The Buddhist notion express that all things and experiences are inconsistent, unsteady, and impermanent. Human life embodies this flux in the aging process, the cycle of rebirth, and in any experience of loss. Buddhist teaching teaches human beings to accept the human life. In addition, prayer or reading dharma book and meditation was performed by patients waiting for CABG. Some patients performed Buddhist prayer because they believed in supernatural powers. They hope that the sacred prayers could help their circumstances to be cured. Moreover, using religious coping by performing

meditation to manage their symptoms was also reported by patients waiting for CABG (Bunkong, 2009).

Bunkong (2009) also found that Islamic patients also used religious coping to manage their psychological symptoms by putting trust in God (*Allah*) and prayer (*La-Mad*). They believed that sickness is a test from God. Islamic teaching teaches human beings how to face difficulty in life, such as illness, suffering, and death. Muslims view these problems as tests from God, which should be handled with patience and prayers. They consider an illness as well as other tests as atonement for their sins to achieve the best life in the hereafter. Despair, hopeless, and frustration are not considered good in Islamic belief because everything that happens on the earth is with God's supervision. Hope and optimism for the best life in the future is embedded in Islamic philosophy (Ibrahim, 2004). Therefore, integrating the right understanding, right thought, right effort, right mindfulness, and right concentration into their experiences lead patients to understand or gain insight in the true nature of human life and to prepare their mind to accept or reject the uncertainty or impermanence of their illness. Consequently, the patients' suffering was found to be diminished.

Additionally, other strategies, such as distraction and seeking information were also used for managing the psychological symptoms. Distraction used by patients was meeting their friends. This strategy may temporarily distract patients' attention away from the psychological problems. Seeking information was another alternative strategy reported by patients waiting for CABG to reduce the level of psychological symptoms. Information about the disease, operation date, ongoing treatment, cardiac surgery, and complications of surgery were shown to be the

patients' needs which were also reported in study of Lindsay, Sherrad, and Bickerton (1997). Accurate information about what will be the outcome of the surgery can reduce fear and anxiety of the unknown situation.

Social Management

Patients undergoing CABG need a social support and social network to cope with their fears, anxiety, and depression (McMurray, 1998). Support from the spouse is of particular importance, as is that from children, friends, neighbours, and coworkers (Hawley, 1998; Kirkevold Gordner, Berg, & Satvold, 1996; Koivula, Paunonen-Ilmonen, Tarkka, & Laippala, 2002; McMurray, 1998; Yates, 1995). Koivula et al. (2002) found that family members or relatives are important resources to assist patients in managing their symptoms during waiting for CABG. Bunkong (2009) indicated that after symptom onset, some patients usually consult with their family members about their acute symptoms. The family members were the co-sufferers while they were caring for their ill loved ones. Suffering from severe illness was perceived as being very important by the relatives. In Bunkong (2009), the management provided by the relatives includes massaging, back thumbing, seeking information, and soothing. Bringing patients to hospital was the most common strategy applied by relatives. It is possible that most of patients await CABG in this study were elderly. They were most likely unable to go to the hospital by themselves when severe symptoms occurred. Thus, they had to rely on their children or others.

Additionally, Banner (2010) indicated that during the waiting period peer support was also identified as an important mode of support. This took the form of exchanging information with other friends, family members, and volunteer patients who had undergone CABG surgery. Non-direct forms of peer support including case

studies in booklet and videos are important. It addresses the difficulties and allows the exchange of relevant information and experiential knowledge. These findings similar to previous studies which found that patient learned and were inspired from the experience and support of persons who had already had heart surgery (Ivarsson, Larsson, & Sjoberg, 2004; King, 1985; Lamarche, Taddeo, & Pepler, 1998). Like study of Kristofferzon, Lofmark, & Carlsson (2007), it was found that exchanging experience with fellow patients helped them to understand their situation and it was a great support.

In summary, patients waiting for CABG usually perform these management strategies above at home before asking for help from others. However, it was found that when the symptoms were not found to be improved after managing by the first strategy, patients preferred to go the hospital.

Summary

Awaiting CABG surgery is considered the critical period that affects persons' health and well being overtime. Persons awaiting CABG have to face with difficulties, and physical and psychosocial problems that lead them to manage and adjust their lives by themselves in order to maintain their health status and get ready for surgery. Persons who do not successfully manage and adjust their lives during waiting for CABG surgery are at high risk for having poor prognosis and increase risk of morbidity and mortality.

According to the literature review, most studies of persons awaiting CABG surgery were done in western countries, whereas only one study was found in Thailand. Most of primarily studies had conducted by using quantitative method from health care providers' perspective and using biomedical model which could not

clearly explain the experiences as perceived by each unique person. This lead to questions about “What are persons awaiting CABG really experience?”, and “How do persons awaiting CABG manage and adjust their lives during this period?” In order to gain better understanding in the following questions, qualitative approach which aims to explore the phenomena of interest was adopted in this study.