

# International Encyclopedia of Rehabilitation

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# **Coronary Artery Disease and Quality of Life**

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The aim of this chapter is to outline coronary artery disease (CAD) in terms of its effect on quality of life (QoL). To appreciate the effects of CAD on QoL, it is important to outline the symptoms, risk factors, treatment options and consider some of the interventions used to treat CAD and thus affect QoL.

## **Prevalence of CAD**

CAD is still the leading cause of death in high income countries with 1.33m deaths accounting for 16.3% of total deaths and becoming a significant cause of death in low to middle income countries. It is expected that cardiovascular disease that includes heart disease and stroke (CVD) will be the leading cause of death worldwide with 20 million deaths predicted in 2015 (WHO 2008). CAD in its many forms is a chronic disease with symptoms that require ongoing monitoring and treatment to prevent further complications such as myocardial infarctions (MIs) and chronic heart failure (CHF). Although the mortality rates from CAD have steadily declined over time, a substantial increase in those living with some form of CAD is evident and this is due to the prevalence of CAD behavioural risk factors.

## **Risk factors associated with CAD**

The risk factors associated with CAD are well established and can be classified as background, behavioural and physiological factors. Background factors include epigenetics, reduced height, low birthweight, gender, social class, race and geographical location. Behavioural factors include reduced physical activity, a poor diet high in saturated fats, smoking and stress. The physiological factors associated with CAD include hypertension, increased plasma insulin and increased plasma cholesterol. The causes of CAD are multifactorial and arise from an interaction of these risk factors. From a disease perspective, the current focus is on reducing the behavioural risk factors to prevent MI and CHF. Changes to diet, stopping smoking and increasing physical activity levels can significantly reduce the risk of developing CAD and further complications. The important point is that these behavioural risk factors are modifiable.

It is important for the healthcare professional to assess an individual's cardiovascular risk factors. One landmark study (the INTERHEART study) demonstrated that in the majority of heart attacks, over 90% of the risk were associated with nine main risk factors. These risk factors identified were cigarette smoking, abnormal blood lipid levels, hypertension, diabetes, abdominal obesity, a lack of physical activity, low daily fruit and vegetable consumption, alcohol overconsumption and psychosocial index (INTERHEART Study investigators 2004). In this 52 country case-control study, the investigators noted that the results were independent of gender, ethnicity and geographical location. This strongly supports the results applicability to any population group.

The correlation between CAD and risk factors is evident in other studies, particularly high cholesterol, hypertension and diabetes (Greenland et al. 2003, Vasan et al. 2005). These three risk factors significantly increased the risk of fatal CAD (Greenland et al. 2003). The risk of MI is significantly reduced in those with none of these risk factors in the NHANES II Study reporting the risk for fatal CAD 51% lower for men and 71% lower for women when no risk factors were present (compared to those with risk factors present) (Mensah et al. 2005). Healthcare professionals play an important role in helping reduce incidents associated with CAD.

The prevalence of risk factors is challenging and a worldwide problem. Statistics from the American Heart Association (AHA) reported that an estimated 80.7 million Americans (1 in 3) are living with some form of CVD (AHA 2008). Figures from the US demonstrate a prevalence of 73 million people has hypertension (1 in 3) and 48% (106 million) have raised levels of total cholesterol (NHANES 2001-04) with a further 17% of the population (37 million) having raised levels. The high prevalence of these modifiable risk factors and the associated risk of CAD support the need to assess individuals who present with symptoms that are suggestive of undiagnosed CAD.

## **Symptoms and treatment of CAD**

The main manifestation of CAD is chest pain (angina) caused by narrowing of the coronary arteries reducing the delivery of oxygenated blood to the myocardium. In the case of a sudden onset of symptoms, the acute presentation requires urgent medical attention as an occluded artery will result in a MI. The severity and frequency of angina often reflects the degree of coronary artery narrowing and CAD progression. Other symptoms include breathlessness (especially if associated with exertion), fatigue, nausea and dizziness. A thorough clinical assessment is required in conjunction with cardiovascular risk factor assessment and obtaining a detailed medical history. The symptoms reported by a patient often reflect physical health limitations and ability to undertake activities of daily living (ADLs). Left ventricular function (the main pumping chamber in the heart) as detected by echocardiography provides an accurate clinical assessment of myocardial (i.e. heart muscle) function. For those experiencing severe angina with central chest pain radiating to the right arm and jaw; the majority will seek urgent medical treatment as most people know that a heart attack is life-threatening and potentially fatal. For others with intermittent symptoms, they often don't seek immediate treatment unless their ADLs are significantly affected. Patients often put their recent fatigue and feeling more tired than usual down to getting old or stress and if atypical angina occurs (i.e. not central chest pain), relate their symptoms to indigestion. Often the onset of symptoms is the first time an individual may seek treatment and relief of symptoms. It is often at this stage that several CAD risk factors are formally diagnosed.

In the case of chronic angina, it is usually associated with exertion and requires ongoing medical management. The goal of CAD treatment is to eliminate symptoms and reduce the risk of future MIs. Treatment ranges from lifestyle modification (reducing saturated fat intake, increasing physical activity level and stopping smoking), to pharmacological treatment (including lipid lowering, beta-blockers, blood pressure lowering agents) and interventional procedures (usually percutaneous coronary intervention -known as PCI) where the coronary artery is ballooned and often a metallic stent is inserted. The initial treatment is pharmacological in stable angina but the COURAGE trial has demonstrated the benefits of optimal medical therapy in conjunction with PCI (Shaw et al. 2008) and a further meta-analysis has shown the long-term benefits of this approach in stable angina (Schomig et al. 2008). The most commonly performed surgical procedure is Coronary Artery Bypass Graft Surgery (CABGS). These procedures specifically relate to improve blood flow through the coronary artery but it is the lifestyle modification and medication adherence that reduce/control the modifiable risk factors. Interventions are conducted to alleviate angina and breathlessness and increase exercise tolerance that will hopefully lead to better functional capacity and physical activity levels, and allow individuals to perform daily activities independently and without symptoms. There are endorsed clinical guidelines in managing CAD and the risk factors that include lowering cholesterol, managing hypertension, promoting better diets, increasing physical activity and maintaining ideal body weight. Examples of guidelines are available from the American Heart Association in conjunction with the American College of Cardiology (AHA/ACC website) and the European Society of Cardiology (ESC website). Risk factor management as part of lifestyle modification is crucial if we are to successfully tackle the global problem of CAD.

A recent editorial on the management of stable CAD presented the evidence for the current treatments including pharmacological agents, PCI and CABGS (Yusuf et al. 2009). One of their key recommendations is to provide the most appropriate care and clinical re-evaluation to be undertaken if the patient's condition changes. However a major limitation of this editorial is that the authors do not include subjective patient evaluation when considering the management of CAD. Undoubtedly it is important to objectively assess CAD progression and the efficacy of treatment through diagnostic tests but subjective data such as QoL questionnaires can also provide useful information. The subjective meaning of illness has not been widely investigated and from a clinical perspective, it is much easier to quantify symptom relief than to rely upon the individual's self-reported QoL. However QoL may reveal important information not gained from the clinical data.

## **Quality of life and CAD**

An advantage of QoL is that it not only takes physical health into consideration but emotional, social and functional aspects of life. Physicians' perspectives and patients' perspectives can be very different and what a physician may regard as "a successful procedure" may not be perceived in the same light as the patient or their family. Examining both perspectives may ensure patients and healthcare professionals can set realistic goals about what to expect following interventions, in particular after cardiac surgery. Although the patient's perspective is important, information on QoL can potentially come from several sources: physicians, nurses, spouses and families. The other benefit of measuring QoL is that subjective data is relatively inexpensive and the information is relatively easy to collect. Given the costs associated with CAD and its chronic nature, evaluation combining objective and subjective methods is becoming more common. There are specific questionnaires available for measuring angina such as the Seattle Angina Questionnaire (Spertus et al. 1995) and although it is a validated and useful assessment tool, it focuses only on anginal related limitations (physical limitation, anginal stability, anginal frequency, treatment satisfaction and disease perception). The MacNew questionnaire was also developed specifically for measuring QoL in those with heart disease (Hofer et al. 2004), however its discriminatory power has been queried (Maes et al. 2008).

Although many studies purport to examine QoL in CAD, there is no consensus on what aspects of QoL should be measured. However several variables are commonly reported (i) functional capacity (including physical, intellectual, social and emotional functioning), (ii) perceptions (levels of well-being and satisfaction with life) and (iii) effects of the symptoms of disease (Hofer et al. 2006, Hawkes et al. 2006, Bowling 1995). From the literature, the functioning of the person in terms of physical, emotional and social functioning, and the effect of symptoms on functionality (i.e. to undertake ADLs), are the main issues in patients with CAD. A common criticism is the interchangeable terminology in use, in particular QoL, health-related QoL (HRQoL), health status and functional status. For the purposes of this chapter, QoL will specifically focus on health-related quality of life relating to functional capacity and symptoms.

## **Measuring QoL**

When examining QoL, it is important to choose a suitable tool that captures all the relevant aspects. It should be noted that QoL questionnaires can be categorised into disease specific (such as the Seattle Angina Questionnaire, MacNew questionnaire and the Sickness Impact Profile) and generic questionnaires include the Nottingham Health Profile (NHP) and the Short Form-36 Health Survey (SF-36) (Ware et al. 1994). The SF-36 questionnaire is widely used in the cardiac population and it examines HRQoL relative to physical health (physical functioning, physical role limitations, bodily pain, energy and general health perceptions) and emotional health (mental health, social functioning and emotional role limitations). Those who score low in physical domains (physical functioning, physical role limitations, bodily pain, social functioning, and energy and vitality) can experience difficulties in performing ADLs that can be attributed to physical illness. The other main advantage

of the SF-36 is summary scores for physical and mental health and their ability to differentiate between physical and mental health problems.

The SF-36 has been used in conjunction with clinical information to predict mortality after cardiac surgery (Rumsfeld et al. 1999), unplanned hospital admission in those with chronic illness (Pearson et al. 1999), in octogenarians (Fruitman et al. 1999) and via telephone interviews (Herzog and Kulka 1989). The SF-36 lends itself to be useful in multiple disease presentations, across most ages and via different methods. One criticism of the SF-36 is that it is a 36-item questionnaire and as a consequence the SF-12 was developed. A further concern with the SF-36 is the need to undertake recoding and several steps of analysis to obtain the summary scores.

In the case of MI, the treatment of patients involves urgent PCI or thrombolysis to minimize the damage to the myocardium and therefore it is not possible to examine QoL due to the life-threatening nature of the MI presentation. However studies have shown a correlation between angina and QoL. Fitzsimons et al. (2000) found a significant relationship between morbidity and the SF-36 and severity of angina and a significant association between functional status (as measured by the SF-36) and angina grade ( $p < .005$ ). The results demonstrated a decrease in some domains from six months to twelve months on the waiting list for CABGS. It would seem that there are significant physical and psychological issues for patients with angina (especially in those waiting for cardiac surgery).

For patients requiring cardiac surgery, they want to know the risks and the benefits of the operation. There have now been many QoL studies published highlighting the long-term benefits of CABGS (Lee 2008, Herlitz et al. 2000, Caine et al. 1999) in terms of physical health, absence of symptoms and improved functional ability. However CABGS is not curative and often symptoms can return, especially angina. In those who experience angina several years after CABGS, a strong association between the presence of symptoms and restrictions in activities and decline in physical functioning is reported (Herlitz et al. 2000, Caine et al. 1999). Interestingly, studies have examined clinical parameters in relation to functional capacity of the individual, that is, if a person has reduced cardiac function this correlates with a patient's subjective QoL. Caine et al. (1999) reported poor left ventricular function as a predictor of patient functional ability using multivariate analysis. Interestingly, poor pre-operative HRQoL was also a strong predictor of a reduction in HRQoL five years after surgery. QoL questionnaires therefore can assist in monitoring patients' symptoms and thus their functional ability following CABGS.

## **Factors that affect QoL in CAD**

There are several factors that affect QoL and when examining QoL, it is important to consider these variables. The main variables are depression, anxiety and the presence of other diseases/conditions. It is important to consider these factors when planning and managing patient care and in particular when planning cardiac rehabilitation programs. There are other factors that affect QoL related to the environment and social determinants of health (Lee & Carrington 2007).

Over the last decade, the prevalence of depression is widely reported and it is now well established that depression is an important risk factor associated with CAD with estimates of 10% to 40% of CAD patients experiencing depressive symptoms (Ruo et al. 2003, Sheps & Shepard 2001). Depression is both a primary and secondary risk factor for CAD mortality and morbidity-independent of the traditional risk factors such as smoking, hypertension and dyslipidaemia. Guidelines recommend that all CAD patients be screened for depression (Lichtman et al. 2008).

Depression is strongly correlated with the presence of angina within a CAD population (Frasure-Smith et al. 2005) and angina severity is related to QoL (Pocock et al. 1996). Another study demonstrated that angina is predictive of significantly worse emotional, physical and social health

related QoL and a higher depression level on the SCL-90 (Gravelly-White et al. 2007). The authors reported that at a six-week follow-up, patients with angina reported significantly worse QoL. It is evident that angina symptoms in CAD patients affect QoL and the presence of depression/depressive symptoms adversely affects QoL.

From a disease burden perspective, the presence of depression in CAD is associated with increased healthcare utilization and higher rates of hospitalization and emergency department visits (Jiang 2008). The majority of studies have concentrated on clinically diagnosed major depression but there is evidence supporting the effects of self reported depressive symptoms in individuals. Low levels of depressive symptoms can predict risk of CAD. One of the interesting findings is that self-report is important and should be examined. A study demonstrated that self perceived cardiac health status is independently predictive of long-term mortality in those with CAD (Spertus et al. 2002). A higher perception of disease burden is also reported in depressed patients compared to non-depressed patients (Ruo et al. 2003). One study demonstrated a lack of functional improvement in depressed patients six months following cardiac surgery demonstrating that depression affects physical health and functional ability as well as mental health. A common recommendation is the need for better psychological evaluation in patients undergoing CABGS and better management of those with depressive symptoms with an aim of improving their QoL after surgery (Goyal et al. 2005, Mallick et al. 2005, Hofer et al. 2006). Serotonin selective reuptake inhibitors (SSRIs) are commonly prescribed to treat depression and are effective in reducing symptoms and are pharmacologically safe. However, there is no consensus on the optimal manner to treat depression in CAD patients from the three major studies that have examined the use of anti-depressants in those with major depression (SADHART, ENRICHD and CREATE).

Anxiety is another psychological state investigated in relation to CAD but there is a paucity of evidence. The prevalence of anxiety in those with CAD has been reported at 36% with a lifetime report of anxiety disorder of 45% (Todaro et al. 2007). Some studies have reported an association between anxiety and the development and recurrence of CAD (Shen et al. 2008, Todaro et al. 2007, Lavie & Milani, 2004). A high prevalence of generalised anxiety and moderate to severe anxiety symptoms was reported in CAD patients (Lavie & Milani 2004). A 12-year longitudinal study confirmed the importance of anxiety in relation to MI (Shen et al. 2008). In the Normative Ageing Study, anxiety was found to be a predictor of MI in men over 60 years. Although there are many confounding variables that must be considered whilst examining the role of anxiety in CAD and subsequent CAD-related events, there is evidence to support anxiety as an independent risk factor for CAD.

Finally, the presence of comorbid illness affects QoL in those with CAD. As highlighted by Netuveli et al. (2005), there can be a fourfold increase in functional limitation in those with chronic conditions and it seems important that healthcare professionals recognise the negative effect of chronic illness on QoL. For those with CAD who underwent CABGS in the presence of comorbid illness, there were substantially more symptoms (angina and breathlessness) and a higher rate of pre- and post-operative MIs (Lee 2009). The study also reported that the majority of patients perceive themselves to have good QoL five years post CABGS, however the presence of comorbid illness has a negative effect on physical QoL (Lee 2009). Sawatzky et al. (2005) observed that those with chronic illness tend to participate in less physical activity which in turn can worsen their physical QoL and increase problems such as immobility and pain. The challenge seems to be to balance the symptoms of chronic illness from comorbidities and maximising the benefits of cardiac interventions. CAD is a progressive condition and while procedures seek to relieve symptoms, they are not curative. The importance of monitoring and managing other comorbid conditions is essential to maximise physical QoL.

The challenge for healthcare professionals is to assess patients, recognise and treat these potentially confounding variables and ultimately improve a patient's QoL. The final question is how can this be achieved?

## **Improving CAD outcomes**

One of the key methods of improving CAD outcomes is with cardiac rehabilitation programs including promoting physical activity and improved diet and stopping smoking. The benefits of cardiac rehabilitation programs are well established (Lavie et al. 2009) (home based and hospital based) regarding physiological parameters, improved psychological status, in the elderly and in terms of cost effectiveness. Although it should be noted that there are still a significant number of patients who drop out or do not attend rehabilitation. However given the importance of behavioural lifestyle modification, any cardiac rehabilitation program must encompass all the modifiable risk factors.

The positive benefits of exercise in relation to the primary and secondary prevention of CAD are well documented (Hakim et al. 1999, Steptoe 1992). Physical activity decreases the resting blood pressure, increases serum HDL cholesterol and decreases triglycerides independently of any weight loss (Lean 1998). As a consequence, the Chief Medical Officer in the UK has recommended a minimum of 30 minutes of moderate intensive physical activity on five or more days a week (Department of Health 2004). The benefits of physical activity have been reported in patients with CAD (Ayabe et al. 2004, Aldana et al. 2003, Schairer et al. 2003).

Programs to aid patients to stop smoking are also available with one recent study demonstrating that hospital-initiated smoking cessation in those with CAD is successful in a randomized controlled trial. Patients were allocated to either an intensive group or a minimal group. The results demonstrated significantly higher adherence in the intensive group compared to the minimal group ( $p < 0.001$ ) (Smith and Burgess 2009).

Examining clinical objective findings in conjunction with a patient's personal subjective experience ensures a good understanding of a patient's QoL. In doing so, the possibility of improving patient care is enhanced. Potentially this information can be used when advising patients on physical activity after CABGS and setting realistic rehabilitation goals. The following recommendations are presented below to improve QoL in those with CAD:

## **Recommendations**

QoL questionnaires should be integrated into clinical practice to assist in evaluation of QoL in those with CAD, especially in longitudinal follow-up following procedures.

All patients should be screened for depression, given that is now a recognised independent risk factor for CAD.

Patients should be referred for cardiac rehabilitation that is multidisciplinary in approach to ensure optimal management of their behavioural risk factors is achieved along with medication adherence.

When setting rehabilitation goals for patients, other factors such as comorbid conditions must be taken into account so that the goals set are realistic and achievable.

## **Conclusion**

Studies have demonstrated that those with physical health problems often have poor QoL results. The identified need for patient generated data suggests that researchers should devise, and test, appropriate clinical data gathering strategies and allows health professionals to combine their

clinical objective findings with the patient's personal subjective experience. Given that CAD is a progressive condition, it is important to examine QoL both in the short-term and longer-term (especially after interventions). This body of knowledge can reveal problems in physical and emotional health although the influence of mood and the presence of comorbid illnesses on QoL cannot be ignored. The completion of QoL questionnaires is not time consuming or expensive to administer and allow further regular subjective evaluation. Hopefully by using this approach, patient care may be enhanced and assist in early detection of CAD symptoms.

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