Physical exercise and quality of life in patients with cardiac disease

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ABSTRACT
Good quality of life (QoL) that includes physical function, mental and social functions is important for everyone. However, in human life, many things can affect QoL, such as physical and psychological impairments. The prevalent psychological impairments in cardiac patients are anxiety and depression. To overcome these impairments, comprehensive approaches need to be applied to enhance QoL of people, especially those who suffer from chronic diseases, such as cardiac survivors. Exercise rehabilitation, such as aerobic and resistance training, is one of the proper approaches to help cardiac patients overcoming the psychological deficit that accompanies cardiac diseases. It can reduce the level of anxiety and depression, reduce muscle tension, make the patient feel more relaxed, increase confidence and self-esteem in daily life. Physically, exercise contributes to the increase of maximum oxygen consumption, flexibility, strength and endurance of these patients. Training can maintain and enhance physical activity, ability to work and psychological well-being. All together, they are important factors determining the QoL.

Changes in the management of patients with heart disease over time have given patients a chance to live longer. Therefore enhancing daily functioning and well-being tends to gain importance, relevance and meaning. Nowadays, the management of cardiac patients and other chronic diseases has shifted from quantity to quality of life (McEntee and Badenhop, 2000). This essay will focus on the quality of life (QoL) of cardiac patients who have been involved in exercise rehabilitation.

Definition of quality of life
Living longer has been an obsession of many people throughout history (Rooks and Kantrowitz, 2002). This should be accompanied by enhancing daily functioning and well-being. In recent years, the interest in the determination of QoL in people who suffer with chronic illness has increased significantly (Sintonen, 1994), such as in chronic pulmonary disease (Ries,1995), multiple sclerosis (Sutherland, 2001) and cardiac disease(Rooks and Kantrowitz, 2002).

Currently, there are many concepts about the term QoL. Some define QoL as “the excellence of ones life as a whole”. Ferrans and Powers defined QoL as “a person’s sense of well-being that stems from satisfaction or dissatisfaction with the area of life that is important to him/her” (Shively and Wilson, 2001). QoL is a global construct with many objective and subjective dimensions, including the cultural, social, psychologic, interpersonal, spiritual, economic, political and philosophical (Shively and Wilson, 2001).

Some authors prefer to focus the QoL on health. Oldridge defined health-related QoL as “multidimensional and incorporates the physical, psychological, and social domains with or without consideration of specific components, such as symptoms, role function, cognition, general health perception and economic factors” (Oldridge, 1997).

Factors that influence QoL
QoL is recognized as an important outcome in medical care (Santiago and Kaplan, 2004). Several factors can influence the patient’s overall QoL such as personal perceptions, coping mechanisms and environmental constraints (Shepard, 2002). In addition, physical functions (mobility and ability for self-care), intellectual and emotional functions, opportunity for inter-personal contacts and intimacy; capability to perform a meaningful role in work place, the community and the home, feeling of well-being, comfort and self-efficacy, and the frequency and severity of symptoms are considered as other pertinent factors (Shephard and Franklin, 2001).

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Assessment of QoL

Assessment of health status can be done objectively by using physiological measurement (fitness test, lung test, etc.). QoL, however, is based on an individual's expectation and belief about health, maximal functioning and ability to cope (Santiago and Kaplan, 2004).

Assessment of QoL is an important issue that needs to be addressed and it becomes important for measuring the impact of chronic diseases (Guyatt, Feeny et al., 1993). Therefore several measurement techniques have been developed. The measurement techniques that will be chosen should have:

(a) Reliability. This refers to the ability of an instrument to continuously differentiate between subjects (Guyatt, 1993). There are four methods that can be used to assess the reliability of an instrument; test-retest, alternative form, split halves and internal consistency method (DeVon and Ferrans, 2003).

(b) Validity. This is an estimation of the extent to which a measurement tool accurately reflects what it intends to measure (Shepard, 2002; DeVon and Ferrans, 2003).

(c) Sensitivity or responsiveness. This is the ability to detect small but important change (Guyatt, 1993; Sintonen, 1994) within subject over time (DeVon and Ferrans, 2003).

Reliability, validity and responsiveness provide a good response to subtle differences in a person’s QoL. Unfortunately, no unified approach has been devised for measuring QoL and no ideal method has been found. Moreover, each approach has its strength and weakness (Guyatt, 1993; Gill and Feinstein, 1994). Generally speaking, QoL measure should include the assessment of physical function, psychological well-being, and social functioning (Pashkow, Ades et al., 1995).

Instrument to determine QoL

Conceptual frameworks for the assessment of QoL have been developed by several authors. Ferrans proposed a model that includes health and functioning, psychological/spiritual, social and economic and family aspects in assessing QoL. A quite similar one was presented by Ferrel et al that focused on physical well-being and symptoms, psychological well-being, and spiritual well-being. In psychological well-being they included sense of control, anxiety, depression, enjoyment or leisure, fear of recurrence, happiness, fear, cognition and attention. A conceptual model for QoL in the cardiovascular field was created by Wenger and coworkers with an emphasis on functional capacity (daily routine, social, intellectual, emotional and economic), symptoms and perceptions (health status and life satisfaction) (DeVon and Ferrans, 2003).

In cardiac rehabilitation setting, instruments that have been used to determine QoL can be categorized as:

(a) Gestalts-type measurement; early estimates of QoL such as Karnofsky Index expressed a single number finding (Shephard and Franklin, 2001) and Standard Gamble uses patient’s perception to gain the description of QoL using a computer-generated tool (Shephard, Kavanagh et al., 1998; Shephard and Franklin, 2001).

(b) Disease/condition-specific measurement such as Chronic heart failure questionnaire (CHFQ) that examines dyspnea, fatigue and emotional function; the Seattle Angina Questionnaire for physical limitation, angina frequency, angina stability, satisfaction with the treatment and perceptions of the disease (Guyatt, 1993; Oldridge, 1997; Shephard and Franklin, 2001; DeVon and Ferrans, 2003); the Minnesota Living with heart failure questionnaire scores physical and emotional functions (Guyatt, 1993; Oldridge, 1997; Shephard and Franklin, 2001); the Kansas City Questionnaire measures physical limitation, symptoms, symptom stability, social limitation, self-efficacy, quality of life, overall functional status and clinical status (Shepard, 2002); and the Mac New QoL after Myocardial Infarction Questionnaire (QLMI) (Oldridge, 1997; DeVon and Ferrans, 2003).

(c) Function specific instrument include Profile of Mood State, Symptom-rating test, The psychological general well-being Index (Shephard and Franklin, 2001).

(d) Generic questionnaires (Shephard and Franklin, 2001; Shively and Wilson, 2001; Shepard, 2002) that explores a broad range of health elements and QoL such as Medical Outcome Study Short-Form36 (MOS SF-36) questionnaire. It is a self administered questionnaire to survey health status and satisfaction (Brazier, Harper et al., 1992; DeVon and Ferrans, 2003. MOS SF-36 measures 8 dimensions of health covering physical functioning, social functioning, role limitation due to physical problems, bodily pain, mental health, role limitation due to emotional problems, vitality and general health perception (Brazier, Harper et al., 1992; Shephard and Franklin, 2001; DeVon and Ferrans, 2003); the Sickness impact profile consists of twelve categories.
which are ambulation, mobility, body care, movement, social interaction, alterness behavior, communication, emotional, eating, work, home management and sleep (Guyatt, 1993; the Nottingham scale; and the QoL Index (QLI) which is a comprehensive instrument designed to assess generic QoL in healthy population as well as those with illness. It consists of two parts which are satisfaction and importance and measures physical function such as ability to perform activities of daily living, the severity of symptoms, a visual analog assessment and psychological well-being aspect (Shephard and Franklin, 2001).

Documenting QoL changes require an appropriate instrument and needs better interpretation of QoL data (Engebretson, Clark et al., 1999). The decision for choosing which instrument to use in a particular setting depends on the instrument’s class, purposes and properties (Oldridge, 1997).

Psychological manifestation of cardiac diseases

People who suffer cardiac disease are faced with the prospect of changing their daily lives, depending on the severity and complexity of the disease (Pollock, Franklin et al., 2000). The client may have a variety of physiological and clinical manifestations according to the kind of cardiac disease while the psychosocial manifestations are mostly the same for each cardiac disease. These cardiac conditions include acute myocardial infarction, angina pectoris, congestive heart failure, coronary artery by pass graft surgery (CABS), percutaneous transluminal coronary angioplasty pace maker and peripheral vascular disease (PVD) (Lavie and Milani, 1994).

The commonest physiological manifestation that may have a negative impact on the QoL of a cardiac client is the decreased functional capacity that occurs in all cardiac diseases (Shephard and Franklin, 2001). On the other hand, depression, anxiety, emotional distress, job strain, lack of energy, feeling of hopeless, loss of libido and hostility are psychological manifestations that are evoked in these specific clients (Blumenthal, 1985; Shephard and Franklin, 2001). Casen and Hackett used the term “ego-infarction” for these psychological impacts on cardiac patients (Blumenthal, 1985).

Anxiety is “the subjective experience of dread and foreboding that occurs in conjunction with unpleasant feelings of somatic tension, nervousness, apprehension and worry and activation of the autonomic nervous system” (Doerfler and Paraskos, 2004). Usually after acute myocardial infarction (AMI) or other cardiac disease event, anxiety is the first emotional reaction evoked in patients. The causes of anxious thought include fear of death, apprehension of further damage, concern with the symptoms such as pain and dyspnea, and fear of being abandoned and isolated (Blumenthal, 1985). The signs of severe anxiety include chest discomfort or pain, dyspnea, cold sweat, upper body discomfort, lightheadedness or feeling faint (Santiago and Kaplan, 2004). Anxiety can be minimized with exercises that associated with increase in self-efficacy (Andersen and Sutherland, 2002).

Depression often persists and may last up to a year or more in cases where patients show fear of loss of income, loss of sexual function, and physical disability (Blumenthal, 1985). Depression is clearly having a detrimental effect on cardiac survivors even in minimal level. After an AMI, about 20-45% clients suffer from significant level of depression (Herridge, Stimler et al., 2005). They had about four times increase in mortality (Milani and Lavie, 1998; Santiago and Kaplan, 2004) and higher rate of infarction and re-hospitalization (Milani, Littman et al., 1993; Milani and Lavie, 1998), experience sexual difficulties and remain out of work (Milani, Littman et al., 1993).

Moreover, depression can affect biological factors and is manifested as ventricle irritability, low heart rate variability and increase risk of cardiac events (Herridge, Stimler et al., 2005; Pasternak, 2005). Herridge and colleagues stated that the impact of depression on QoL and productivity of patient after AMI is more impressive (Herridge, Stimler et al., 2005).

In addition to anxiety, life stress, fatigue or vital exhaustion, lack of energy, feeling of hopeless, loss of libido and hostility, depression has been shown to influence cardiovascular disease outcome (Pasternak, 2005). In a rehabilitation program, the level of depression may affect the patient’s ability to follow and adhere to the program.

Exercise, QoL and psychological changes in cardiac patients

A cardiac rehabilitation (CR) program is designed to enhance the psychological effects of cardiac disease, reduce the risk of sudden death or re-infarction, stabilize or reserve the atherosclerotic process and enhance the psychosocial states as well (Brannon, Foley et al., 1998).

Some researchers pointed out that the major objective of CR is to enhance health related QoL (Oldridge, Guyatt et al., 1988; Shephard and Franklin...
Most of the studies in exercise and heart failure were done in supervised-hospital rehabilitation settings. Recently, Oka et al. evaluated the impact of home-based walking and resistance training programs on QoL in CHF patients. Forty CHF patients (20 in training and 20 in control) were recruited. The training group performed walking, resistance training, and a combination of both 3-5 times/week. The control group remained unchanged. After three months, the training group showed significant improvements in functional capacity, exercise tolerance, and QoL. The results suggest that home-based training programs can significantly improve the health-related QoL in CHF patients.
volunteers were recruited and randomized into two groups. The test was conducted at baseline and after three months exercise intervention. The training group showed improve fatigue (p=0.02), emotional function (p=0.01) and mastery (p=0.04) (Oka, De Marco et al., 2000). This research affirmed that stable CHF patients can perform exercise at home and gain the benefit in both physical and psychological domains.

**Coronary artery disease and bypass graft surgery**

Approximately 80% of all cardiac related deaths are due to arteriosclerosis that narrows the coronary arteries (Tirrell and Hart, 1980). Coronary Artery Bypass Graft Surgery (CABS) alleviates angina pectoris and improves life expectancy in coronary artery disease (CAD) patients (Engblom, Korpilahti et al., 1997). According to Tirrel et al, after cardiac by pass surgery, most of the patients will survive for at least six years (Tirrell and Hart, 1980). Unfortunately, anxiety and depression may accompany one third of them (Engblom, Korpilahti et al., 1997). Other psychological findings in clients that have coronary artery bypass graft surgery include anxiety around the time of surgery, difficulty processing and retaining information during hospitalization, and a moderate decrease in sexual activity. Therefore, CR is arranged to relieve symptoms, increase physical capacity, working ability and psychosocial well-being (Engblom, Korpilahti et al., 1997). In addition, exercise conditioning program becomes an important key to strengthening the cardiac muscle and maintaining maximum physical fitness (Tirrell and Hart, 1980). Other benefits that can be expected in long term graft survivors who were involved in CR include early return to activity in daily living and higher return to work rate (Engblom, Korpilahti et al., 1997; Kostis, Smith et al., 2001).

**Other considerations**

**Women**

Women with CAD have been reported as differing from their male counterparts with regard to exercise capacity and psychosocial characteristics (Todaro, Shen et al., 2004). A gender-specific measurement for QoL in cardiac clients was investigated in some research. Lavie reported women were less likely to experience reductions in depression immediately after CR (Lavie and Milani, 1995). However, improvement in anxiety scores and somatization scores are statistically significant (Lavie, Milani et al., 1995).

Furthermore, McEntee et al proved despite men having higher QoL scores than women when starting CR, women showed greater improvement than men by the end of the thirty six therapy sessions (McEntee and Badenhop, 2000). The degree of benefit of exercise to QoL between the sexes, however, is difficult to conclude due to the limited number of study reporting QoL and sex differences in CR outcome (Todaro, Shen et al., 2004).

**Elderly**

Recognition of depression in elderly cardiac clients has some degree of difficulty due to the similarity of symptoms of depression with organic illness. Milani and associates found some co-morbidities condition that can be used to screen the cardiac survivors that suffer from depression. These co-morbidities that help to identify depression among cardiac patients include reduce functional capacity, lower high density lipoprotein, higher level of anxiety, hostility, somatization, pain, and decrease in QoL scores (Milani and Lavie, 1998).

Previously, data showed that elderly (≥ 65 years old) were not frequently referred to CR. In fact, Milani et al proved that following CR, there was a 57% reduction in depression and a 32 % increase in QoL (Milani and Lavie, 1998). Recent experiment conducted by Lavie and colleagues reported that 268 elderly had improvements in validated scores for anxiety, depression and somatization by 40%, 40%, and 33% respectively following CR (Lavie and Milani, 2004).

Very elderly clients categorized as > 75 or 80 years old were evaluated in one study. CHF men showed dramatic and statistical increase in anxiety score (66%), somatization (42%), depression (56%) hostility (65%) and the total QoL score (20%) (Lavie and Milani, 1995). The same issue was reported in women by Hung et al. Older women with CAD have 26-45% lower peak oxygen consumption (VO2 peak) than age matched healthy sedentary or active women (Hung, Daub et al., 2004). This can affect their independent daily living and overall QoL. Even, Kavagnah and colleagues reported that a 1ml/kg/min decrease of VO2 peak related to 10% therefore increasing the mortality rate of older women with CAD (Hung, Daub et al., 2004). Exercise intervention, however, will reverse the decrease in VO2 peak and muscle strength and as a result there is an improvement in QoL. Combined strength and aerobic training led to significant increase in exercise capacity, lower extremity strength, emotional and
global QoL measured by the Mac New Heart Disease Health-related QoL (Hung, Daub et al., 2004).

Mode of exercise

Exercise may be defined as “any form of leisure activity that is undertaken for a specific purpose, such as the improvement of health, the increase of physical fitness and the extension of life span” (Shepard, 2002). Even though aerobic exercise training is still the corner stone of most CR program, the new paradigm developed in recent years argues for the benefit of resistance training in cardiac survivors. The use of resistance in CR has been argued previously for fear of inducing adverse effects such as elevated blood pressure, heart rate, myocardial oxygen demand and adverse effect on ventricular remodeling and performance (Vescovi and Fernhall, 2000).

Much research, however, have demonstrated that weight training is safe and effective in well screened and low to moderate cardiac risk patients (Pollock, Franklin et al., 2000). Research by Beniamini et al, witnessed the strength-trained group increase their self-efficacy score for lifting, push-ups, climbing and jogging compared to flexibility-trained group. The latest group has lower score in total mood disturbance, depression and fatigue than strength group (Beniamini, Rubenstein et al., 1999). Resistance training plays a significant role in improving and shaping patient’s self esteem and ability to perform daily tasks.

Another issued in strength training is intensity. Low to moderate intensity of strength training is safe and effective in cardiac patients. Then, Beniamini and associates reported that supervised high-intensity strength training was also safe when it was performed together with aerobic training. This intervention resulted in a significant increase in strength and endurance as well as improved body composition and maximum treadmill exercise time (Beniamini, Rubenstein et al., 1997).

Self efficacy

Self efficacy is an important determinant of behavior, including actual attempts and persistence of behavior before giving up (Santiago and Kaplan, 2004). It can be influenced by prior performance, vicarious experience, verbal persuasion, and physiological state (Vescovi and Fernhall, 2000). Low exercise efficacy may impair exercise compliance especially in a non-supervised exercise program. Together with social support, self-efficacy has been shown to be an important predictor of exercise behavior in cardiac patients (Carlson, Norman et al., 2001). Study indicated that exercise and self-efficacy may reduce the anxiety of patients (Andersen and Sutherland, 2002).

CONCLUSION

Quality of life is one important outcome in a CR program. It can be measured by gestalts measurement, disease/condition-specific measurement and general measurement. These measurements should have validity, reliability and sensitivity. The most prevalent psychological symptoms that accompany cardiac survivors are anxiety and depression that affect QoL in most cardiac patients. Exercise regimen, both aerobic and resistance training, have been proven increase fitness level and psychological well-being and so improve QoL of cardiac patients.

SUGESTION

Rehabilitation practitioners who run the exercise program and handle these specific patients need to be aware of the psychological symptoms that are shown by patients. They also need to have basic knowledge to recognize earlier the psychological problems evoked in their patients so they can provide the appropriate program for their patients.

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