

**AN EVALUATION OF NUTRITION EDUCATION IN  
OUTPATIENT CARDIAC REHABILITATION PROGRAMS  
IN VICTORIA**

**by**

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The material in this thesis is original, except where due acknowledgement has been given, and has not been accepted for the award of any other degree or diploma. To the best of my knowledge and belief, it contains no material previously published or written by another person, except where due acknowledgement is made in the text.

*Jh Poxon*

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## ABSTRACT

Outpatient cardiac rehabilitation (CR) programs comprise exercise and education, including nutrition education (NE), and are offered after hospitalisation in order to minimise the risk of further cardiac events. A five-part evaluation of NE in outpatient CR programs in Victoria was undertaken. Initially, a survey-based process evaluation of all outpatient programs (N = 74) found that most had a very limited amount of NE. Dietary fat was a topic common to all and most programs used knowledge-based, didactic education that was not based on a specific model of behaviour change. In a second process evaluation, CR participants (n = 317) were surveyed by questionnaire before NE. The majority were older, overweight, English-speaking men who were myocardial infarction and/or cardiac surgery patients. Knowledge of dietary fat was generally poor but attitude to healthy eating was positive and fat intake was relatively low. A quasi-experimental comparison group program trial was used for an impact evaluation of the effectiveness of NE, with one experimental group (n = 80) having one hour of NE, a second experimental group (n = 80) having 4½ hours of NE, with additional access to the dietitian, and a comparison group (n = 80) having no NE. The 4½-hour group improved in attitude to healthy eating and had a greater improvement in dietary fat knowledge and a greater reduction in fat intake. In a third survey-based process evaluation, most participants were found to be satisfied with NE but older participants were less satisfied. The amount of NE was weakly associated with satisfaction. A one-year follow-up outcome evaluation of CR participants (n = 44) showed that most were overweight at CR and had increased their BMI at follow-up. Fat knowledge, attitude and intake had not changed and subjects' diets generally accorded with recommendations for

patients with heart disease, although mean saturated fat intake was higher. Further research is required to determine the most appropriate behaviour change model for NE in CR programs and the most effective format and educational strategies for facilitating compliance with diets for heart disease.

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The investigation of Part 5: A One-year Follow-up Outcome Evaluation of Nutrition Education in Outpatient Cardiac Rehabilitation Programs, was carried out by Fiona Dunn of Deakin University, who designed and carried out the data collection and arranged for the analysis of the food frequency questionnaire by the Anti-cancer Council.

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## ABBREVIATIONS

AHA	American Heart Association
AIHW	Australian Institute of Health and Welfare
BMI	Body mass index
CABG	Coronary artery bypass graft
CHD	Coronary heart disease
CR	Cardiac rehabilitation
CVD	Cardiovascular disease
DHA	Docosahexaenoic acid
EPA	Eicosapentaenoic acid
GI	Glycaemic index
HDL	High density lipoprotein
HF	Heart Foundation
LDL	Low density lipoprotein
Lp (a)	Lipoprotein (a)
MD	Mean difference
MI	Myocardial infarction
MUFA	Monounsaturated fatty acids
NCEP	National Cholesterol Education Project
NE	Nutrition education
NNS	National Nutrition Survey
PS ratio	Polyunsaturated fatty acid to saturated fatty acid ratio
PTCA	Percutaneous transluminal coronary angioplasty
PUFA	Polyunsaturated fatty acids
VCRQ	Victorian Cardiac Rehabilitation Questionnaire
WHR	Waist:hip ratio

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## **CHAPTER 1**

### **LITERATURE REVIEW**

#### **Introduction**

Cardiovascular disease (CVD) is a major cause of mortality and morbidity in Australia. The underlying disorder responsible for most CVD is atherosclerosis, which causes narrowing of arteries, increased thrombus formation, impaired circulation, coronary heart disease (CHD), myocardial infarction (MI) and stroke.

The Australian Institute of Health and Welfare (AIHW) reports that CHD was the main single cause of mortality in Australia in 2000, responsible for twenty-one percent of deaths (Mathur, 2002). The incidence rate of CHD among those aged 40-90 years was 605 per 100,000 (48,313 people) in 1999-2000 and rates were higher in Aboriginal and Torres Strait Islander Australians and people of lower socioeconomic status. Almost half of all these coronary events were fatal. In 2000, men aged 40 to 90 years were almost twice as likely to die of CHD as women of the same age range and men are likely to die at an earlier age than women. People surviving an MI and having a second episode are at much greater risk of sudden death.

Between 1993-94 and 1999-2000, CHD deaths declined by over thirty percent and incidence rates declined by twenty percent (Mathur, 2002). There have been fewer hospital admissions for MI during this period and in-hospital survival from major coronary events has improved, as well as survival overall.

Data from the large-scale Framingham Heart Study, 1950-1989, examining twenty-year trends in CVD risk factors, incidence and mortality in residents of the town of Framingham, Massachusetts, USA, show that CVD mortality declined by 51% in women between 1950 and 1989 and by 44% in men and it has been estimated that more than one half of the decline in women and one third to one half of the decline in men was due to improvements in risk factors in the 1970 cohorts (Sytkowski, D'Agostino, Belanger, & Kannel, 1996). A data review using computer simulations suggests that, for the period 1980-90, only one quarter of the decline in the USA was due to reducing the risk in people with no evidence of disease (primary prevention) and most of the decline was due to improved management of patients with CHD (secondary prevention) (Hunink et al., 1997). The review concludes that secondary prevention may be more cost-effective than primary prevention.

A range of risk factors have been identified that contribute to CHD and dietary factors play an important role. Cardiac rehabilitation (CR) is a secondary prevention approach designed to reduce modifiable risk factors in patients with heart disease and thereby reduce the incidence of future coronary events.

In this literature review, CHD risk factors in general, the dietary factors related to CHD and dietary recommendations and dietary interventions for patients with heart disease will be explored as this information would be expected to be the basis of nutrition education (NE) delivered in outpatient CR programs. Dietary risk factors prevalent in Australia and attitudes, knowledge and behaviour related to these will be identified to establish the status of Australians. The structure, aims, objectives and outcomes of outpatient CR programs, participation and drop-out rates, participant preferences and satisfaction will be explored, focusing on

Australian research where possible, to give an overview of what is known about these programs and those who participate.

The underlying principles of health and dietary behaviour will be explored and recommended methods of facilitating dietary behaviour change and their use in NE in CR programs will be discussed. Recommendations for the structure, content and delivery of NE will be presented and research about the effectiveness of NE in CR programs and barriers to dietary compliance will be reviewed to form a basis for the evaluation of NE in Australian CR programs.

Papers included in this literature review have been assessed according to the criteria published by the National Health and Medical Research Council (NHMRC) (National Health and Medical Research Council, 2000). These criteria include the following:

- Level of evidence (type of study design);
- Quality of evidence (methods used to minimise bias and control confounding);
- Statistical precision (the magnitude of the p value and width of the confidence interval);
- Size of the treatment effect (clinical importance);
- Relevance of the evidence (the importance in terms of the patient and the relevance to clinical practice);
- Appropriateness of the outcomes measured (whether endpoints are clinically meaningful and patient-relevant).

The levels of evidence, as outlined by the NHMRC, are as follows (National Health and Medical Research Council, 2000, p. 8) :

- I Evidence obtained from a systematic review of all relevant randomised controlled trials;
- II Evidence obtained from at least one properly-designed randomised controlled trial;
- III-1 Evidence obtained from well-designed pseudo-randomised controlled trials (alternate allocation or some other method);
- III-2 Evidence obtained from comparative studies (including systematic reviews of such studies) with concurrent controls and allocation not randomised, cohort studies, case-control studies, or interrupted time series with a control group;
- III-3 Evidence obtained from comparative studies with historical control, two or more single arm studies, or interrupted time series without a parallel control group;
- IV Evidence obtained from case series, either post-test or pre-test/post-test.

Where possible, good quality systematic reviews and randomised controlled trials, which provide Level I or II evidence, have been included in this review. Cochrane Library reviews have been included, where relevant. There are a relatively large number of high quality studies in the area of CHD risk factors and the role of dietary fat but relatively few in the area of dietary knowledge, attitudes and behaviour of people with CHD and the impact of NE for these patients and most are not recent. Therefore, older studies and those of lower quality were included of necessity when no more recent or better quality studies could be found.

Where possible, Australian studies have been included but these are limited and most of the high-quality studies reviewed have been on populations from countries other than Australia. Subjects in overseas studies would differ from Australian subjects in terms of genetics, diet, lifestyle, social and environmental factors, limiting their relevance to Australians. Studies from the USA, UK and Europe have been reviewed as these subjects would be expected to have more similarities with Australians than those in countries with very different genetic and cultural backgrounds. The factors limiting study quality are discussed in this review and it is noted that no direct extrapolation of results from overseas studies can be made to Australian populations.

## Coronary Heart Disease Risk Factors

The established risk factors for CHD, according to the International Task Force for the Prevention of CHD (International Task Force for Prevention of Coronary Heart Disease, 1999), include personal or family history of CHD, ageing and male gender (when compared to pre-menopausal women) and modifiable risk factors include high blood pressure, diabetes, blood lipid abnormalities, metabolic syndrome, overweight, obesity, insufficient physical activity, excess alcohol intake and tobacco smoking.

There is a continuous relationship between many serum lipid parameters and CHD risk and elevated serum levels of total cholesterol ( $>5.2\text{mmol/L}$ ), low density lipoprotein (LDL) cholesterol ( $>3.5\text{mmol/L}$ ), triacylglycerols ( $>4.5\text{mmol/L}$ ) and lipoprotein (Lp) (a) ( $>0.23\text{mmol/L}$ ), reduced high density lipoprotein (HDL) cholesterol ( $<0.9\text{mmol/L}$  for men and  $<1.0\text{mmol/L}$  for women) and an elevated total cholesterol/HDL cholesterol ratio ( $> 5$ ) are generally regarded as important risk factors (International Task Force for Prevention of Coronary Heart Disease, 1999). Other contributing factors currently under investigation are endothelial dysfunction, chronic inflammation, plaque instability, abnormal blood clotting, elevated homocysteine and abnormalities of genes affecting lipoproteins, glucose metabolism and blood pressure.

A comprehensive review of studies on endothelial function in CVD has shown that endothelial dysfunction is an early marker of CVD and is characterised by increased activation, leading to increased production of cell adhesion molecules and cytokines, and reduced vasodilation, due to reduced production of nitric oxide (Brown & Hu, 2001). Plaque fissuring and occlusive thrombosis can lead to acute coronary events and is associated with chronic inflammation and elevated

C-reactive protein, fibrinogen, clotting factor VIIc and plasminogen activator inhibitor I (International Task Force for Prevention of Coronary Heart Disease, 1999).

Homocysteine is formed from methionine, which requires vitamin B12 and folate for reconversion to methionine, and low levels of these vitamins are associated with elevated homocysteine (Ubbink, van der Merwe, Vermaak, & Delport, 1993). Homocysteine has been implicated in oxidation of LDL cholesterol, smooth muscle proliferation in the artery wall and endothelial dysfunction and is related to atherosclerosis and CHD (Bousney, Beresford, Omenn, & Motulsky, 1995).

While there is some evidence of gene abnormalities in patients at risk of heart disease (International Task Force for Prevention of Coronary Heart Disease, 1999), more research is needed to determine the effects of these on CHD risk.

### **Serum Cholesterol**

A large-scale prospective epidemiological study of an American population, the National Health and Nutrition Examination Survey (NHANES) I, was commenced in the 1970s to investigate cardiac risk factors. A sixteen-year follow-up of 5,811 subjects ( 3,226 women and 2,585 men) aged 56 to 90 years was undertaken, with those who had been following a special diet excluded (Gartside, Wang, & Glueck, 1998). Results showed that 34% had hospitalisation or deaths due to CHD over that time and positive associations were found, using logistic regression, between CHD events and age, total serum cholesterol, tobacco smoking and body mass index (BMI) (body weight (kg)/height (m)<sup>2</sup>) and inverse associations between female gender, alcohol, physical activity and fish intake. Although no causal relationship could be established from such a study and other

possible confounding variables may have been factors affecting the reported associations, the relationship between total serum cholesterol and CHD has been confirmed in other large epidemiological studies.

Total serum cholesterol has been shown to be linked with increased risk of CHD in large-scale prospective studies such as the Multiple Risk Factor Intervention Trial (MRFIT) (n = 356,222) (Stamler, Wentworth, & Neaton, 1986) and the Seven Countries Study (Verschuren, Jacobs, Bloemberg, Kromhout, & Menotti, 1995). Primary screenees in the MRFIT study were male aged 35 to 57 years with no history of hospitalisation for MI recruited in eighteen US cities from community groups, house-to-house canvassing and mass media publicity. Although not randomly selected, this is the largest cohort studied using standardised cholesterol measurements and long-term mortality follow-up. Although not all possible confounding variables were taken into account, blood pressure was measured (average of second and third readings) and demographic information, smoking status, previous hospitalisation for heart attack and the use of medication for diabetes were recorded by questionnaire.

The age-adjusted relative risk of CHD death at six-year follow-up for those in the highest quintile of total serum cholesterol compared to the lowest quintile was 3.42. The relationship between CHD deaths and total serum cholesterol was continuous, graded and strong and was similar in smokers and non-smokers and hypertensive and non-hypertensive subjects. A twelve-year follow-up (n = 316,099) demonstrated a similar relationship, with a graded increase in CHD deaths in those with serum cholesterol above 4.65mmol/L and also showed that smokers with the highest quintiles of serum cholesterol and systolic blood pressure had twenty times the risk of CHD death compared to non-



smokers in the lowest quintiles for both variables. Elevated blood pressure, elevated serum cholesterol and the number of cigarettes per day were significant predictors of CHD death in all age groups.

The Seven Countries Study, commenced by Ancel Keys in the 1960's, was a prospective study of total serum cholesterol and CHD mortality in 12,467 men aged 40 to 59 years in 16 cohorts located in five European countries, the USA and Japan. At twenty-five-year follow-up, it was found that total serum cholesterol was linearly related to CHD mortality across cultures (Keys, 1980). The large numbers of subjects and countries involved in these studies increase the strength of the evidence in men but the relevance of these results to women was not established.

In elderly people, the importance of serum cholesterol levels is controversial. A smaller-scale, prospective American study (the Established Populations for Epidemiological Studies of the Elderly) of 2,527 women and 1,377 men who participated in the sixth annual follow-up has shown that, for those aged seventy-one years and over, elevated total serum cholesterol may be a significant risk factor for CHD mortality in women but not men (Corti et al., 1995). This relationship may have been confounded by the fact that low serum cholesterol may be a sign of chronic illness but a further study that controlled for markers of poor health found that elevated serum cholesterol was associated with risk of CHD mortality in those over 80 years of age (Corti et al., 1997). Genetic, lifestyle, dietary, environmental and socio-economic factors and access to health care may alter the importance of serum cholesterol as a risk factor, as data from the Seven Countries Study shows that death rates from CHD differ in different regions of the world for a given serum cholesterol level (Verschuren et al., 1995).

## Serum Lipoproteins

Different types of lipoproteins in serum have been found to have a greater influence on CHD risk than total cholesterol. A review of lipoprotein metabolism (Kwiterovich, 2000) concluded that LDL cholesterol, VLDL cholesterol and remnant VLDL and Lp (a) can promote atherosclerosis and that HDL cholesterol is protective.

It is now accepted that elevated LDL cholesterol is an important risk factor in coronary atherosclerosis (International Task Force for Prevention of Coronary Heart Disease, 1999). A wide-ranging meta-analysis of ten prospective studies, three international studies and 28 randomised controlled trials showed that reductions in total and LDL cholesterol were associated with a decreased risk of CHD incidence of approximately 25% after five years in randomised trials, of 27% in long-term prospective studies and of 38% in the international studies (Law, Wald, & Thompson, 1994).

Oxidised LDL cholesterol and the LDL particle density are also implicated in CHD risk. Oxidised LDL cholesterol is believed to be more atherogenic as it is the form of LDL cholesterol that builds up in artery walls (Steinberg, Parthasarathy, Carew, Khoo, & Witztum, 1989). In a systematic review of clinical studies of LDL cholesterol density and its relationship to atherosclerosis, small, dense particles of LDL cholesterol were found to be more susceptible to oxidation and a preponderance in serum was associated with atherosclerosis, visceral obesity, lack of physical activity, increased serum triacylglycerols and reduced HDL cholesterol (Slyper, 1994).

HDL cholesterol transports cholesterol away from body tissues and is strongly cardioprotective (Kwiterovich, 2000). Low HDL cholesterol is

significantly linked to CHD incidence and mortality in both older men and women (Corti et al., 1995) and, in 2,045 middle-aged dyslipidaemic men in the randomised controlled Helsinki Heart Study, the LDL/HDL cholesterol ratio was found to be the best single predictor of cardiac events (Manninen et al., 1992). A high-risk subgroup was identified in which elevated LDL:HDL cholesterol together with elevated serum triacylglycerols had a relative risk of 3.8 compared to those with lower levels of each parameter. However, these results are applicable to a population from Finland and may not be relevant to other countries with different genetic, lifestyle and dietary influences.

Lp (a) is atherogenic because it promotes clotting and is susceptible to oxidation and has been found, by meta-analysis, to be an independent risk factor for CHD events in men and women (Danesh, Collins, & Peto, 2000). In the prospective Münster Heart Study of 2,600 middle-aged men in Germany, elevated fasting Lp (a) was found to be predictive of first major cardiac events after controlling for other variables (Assman, Schulte, & von Eckardstein, 1996).

### **Serum Triacylglycerols**

The Münster Heart Study also found that elevated triacylglycerols were predictive of major first coronary events in middle-aged men (Assman et al., 1996). A meta-analysis of seventeen prospective studies was carried out on studies involving 46,413 Caucasian men followed for an average of 8.4 years (2,445 CVD events) and 10,864 Caucasian women followed for an average of 11.4 years (439 CVD events) to determine the relation between serum triacylglycerols and CVD. This meta-analysis found that elevated triacylglycerols were independently associated with risk of CVD, increasing the risk by 14% in men and 37% in women (Austin, Hokanson, & Edwards, 1998).

## **Overweight and Obesity**

BMI is used to determine if an individual is underweight, of acceptable weight, overweight or obese. In Australia, a BMI <20 is regarded as underweight, 20-24.9 as acceptable, 25-29.9 as overweight and >30 as obese in adults (NHMRC Expert Panel on Prevention of Obesity, 1997). The American values are slightly different for underweight (<18.5) and acceptable weight (18.5-24.9) (Dietary Guidelines Advisory Committee, 1995).

In a ten-year follow-up of the large-scale US Nurses Health Study (women, aged 30-55 years, n = 77,690), which began in 1976, and the US Health Professionals Study (men, aged 40-75 years, n = 46,060), which began in 1986, those with a BMI of 25-29 were found to be at higher risk of diabetes, hypertension, elevated serum cholesterol and heart disease and the risks rose with increasing BMI (Field et al., 2001). Increased risk of chronic disease was also associated with a BMI of 22-24.9, a supposedly healthy range, suggesting that it may be healthier to maintain a BMI at the lower end of what is now considered the normal range in Australia. Although these studies are of self-reported data and of selected population groups, there have been validation studies undertaken to assess the accuracy of diagnoses of hypertension, elevated serum cholesterol and diabetes and accuracy appears to be acceptable (Field et al., 2001). The large numbers involved and the length of time of the follow-up give the results credibility.

In the Framingham Heart Study, described earlier (p.2), in those aged 35 to 75 years who were followed for up to 44 years, a positive relationship was found between overweight and obesity and cardiovascular disease (Wilson, D'Agostino, Sullivan, Parise, & Kannel, 2002). The Framingham Offspring Study

of children and partners of the original participants (men, n = 1566, aged 23-76 years and women, n = 1627, aged 19-78 years) found that, adjusted for age, BMI in non-smokers was positively linearly associated with total serum cholesterol, VLDL cholesterol, LDL cholesterol and smaller LDL particle size and inversely linearly associated with HDL cholesterol (Lamon-Fava, Wilson, & Schaefer, 1996). No association with BMI was found for Lp(a).

As BMI does not discriminate between muscle and fat tissue and is not a valid measure for the very fit, very old or for ethnic groups other than Caucasian (NHMRC Expert Panel on Prevention of Obesity, 1997), it has been suggested that visceral (waistline) obesity may be a better indicator of CHD risk (Després, Lemieux, & Prudhomme, 2001). Visceral obesity is associated with elevated triacylglycerols and reduced HDL cholesterol (Després et al., 1990). A value often used to indicate increased risk is a waist/hip ratio (WHR) of >1 in males and >0.9 in women. An American prospective study of 14,040 subjects aged 45-64 years, initially free of CHD, found that the multivariable-adjusted relative risk of CHD increased across quartiles of BMI and waist/hip ratio, with Caucasian men and women having a similar relative risk to that of African Americans (Folsom, Stevens, Schreiner, & McGovern, 1998). Some researchers believe that waist measurement may be more accurate, as WHR may remain stable even when visceral fat increases (Després et al., 2001). In Australia, a waist measurement of  $\geq 100\text{cm}$  in men and  $\geq 90\text{cm}$  in women is regarded as a risk factor for CHD (Eckersley, 2001).

### **Metabolic Syndrome**

“Metabolic syndrome” is a term used to describe a cluster of multiple metabolic abnormalities associated with increased risk of atherosclerosis. The

abnormalities include visceral obesity, hyperinsulinism, insulin resistance and one or more of the following: impaired glucose tolerance, dyslipidaemia, high uric acid levels, excessive blood clotting and fatty deposits in the liver (International Task Force for Prevention of Coronary Heart Disease, 1999). Dyslipidaemia may include elevated total serum cholesterol and LDL cholesterol, small, dense LDL particles, elevated triacylglycerols, low HDL cholesterol and elevated total cholesterol and LDL/HDL ratio. Physical activity, exercise and weight loss can improve or even reverse the metabolic abnormalities (International Task Force for Prevention of Coronary Heart Disease, 1999).

### **Other Risk Factors**

High blood pressure, diabetes, smoking, dietary fats, excess alcohol and lack of physical activity are other well-accepted risk factors for CHD. Evidence from the MRFIT study has shown that elevated systolic and diastolic blood pressure is associated with CHD mortality in all age groups (Neaton & Wentworth, 1992). Both type 1 and type 2 diabetes mellitus are associated with a marked increase in risk of cerebrovascular and peripheral vascular disease and CHD (International Task Force for Prevention of Coronary Heart Disease, 1999). There is a strong association between cigarette smoking and atherosclerosis, MI, unstable angina and sudden death (Winniford, 1990) and it is estimated that smoking contributes to 30-40% of CHD deaths (Fielding, 1985), however, the risk of MI returns to baseline two years after cessation (Gottlieb, 1992). A meta-analysis of 23 studies of physical activity or cardiorespiratory fitness has shown that the risk of CVD or CHD is lower in those fitter or more active (Williams, 2001). The role of dietary fats and excess alcohol intake will be covered in the next section "Dietary Factors and CHD Risk", p.16.

From this review, it can be seen that there are well-identified risk factors for CHD, many of which are amenable to modification. Blood lipid abnormalities appear to have prominent role in CHD and research continues to try to elucidate the underlying mechanisms controlling formation of the various types of lipoproteins. Many of the risk factors discussed are amenable to lifestyle and dietary modification and CR aims to facilitate improvements to patients' diets and lifestyles through a program of education, counselling and exercise in order to prevent future cardiac events. The evidence for the effect of dietary modification on CHD risk will be presented in the next section of this review, in particular as it relates to dyslipidaemia, as this appears to be the most well-accepted diet-related factor associated with CHD.

## **Dietary Factors and Coronary Heart Disease Risk**

Dietary factors are thought to influence CHD by a variety of ways, including affecting blood lipids, blood pressure, blood clotting, blood vessel wall integrity, oxidation processes, homocysteine levels, body weight and insulin function (European Heart Network Expert Nutrition Group, 1998).

### **Saturated Fat**

Ancel Keys' Seven Countries epidemiological study (Keys, 1980), discussed in the previous section (p. 9), showed a positive correlation between dietary fat intake and CHD and subsequent studies have attempted to determine the effect of dietary fat on blood lipids and incidence and progression of CHD.

The cholesterol-raising effect of saturated fat was established over thirty-five years ago (Hegsted, R, Myers, & Stare, 1965; Keys, Anderson, & Grande, 1965). A twenty-five-year follow-up of the Seven Countries Study revealed a strong association with intake of each of the major dietary saturated fatty acids and deaths from CHD (Kromhout et al., 1995). A review of epidemiological studies has found that there is generally a positive correlation with saturated fat intake and serum cholesterol levels in different populations (Caggiula & Mustad, 1997). A review of 248 studies of the effect of dietary fat on serum lipids concluded that saturated fats elevate serum cholesterol and are the main determinants of serum cholesterol levels (Hegsted, Ausman, Johnson, & Dallal, 1993).

The effect of specific saturated fatty acids on plasma lipid levels has also been determined. Although the Seven Countries follow-up study found all saturated fats to be implicated in CHD deaths, they appear to have different actions on risk factors. The saturated fatty acids, lauric, myristic and palmitic acid,



found in fatty meats, dairy fats such as butter and cream, palm oil, coconut oil and fat-containing processed foods, increase serum cholesterol but stearic acid, found in beef fat and cocoa butter, is neutral (Derr, Kris-Etherton, Pearson, & Seligson, 1993; Grundy, 1994; Hegsted et al., 1965). Palmitic acid is the dominant saturated fatty acid in foods (approximately 60% of saturated fatty acids), is found in dairy fats, most meats, palm oil and cottonseed oil, and has the most potent cholesterol-raising action because of its abundance in the diet (Grundy, 1994). Myristic acid is present in much smaller amounts in foods but may be equally hypercholesterolaemic, whereas lauric acid has a weaker effect. Stearic acid increases platelet aggregation and blood clotting (Mitropoulos et al., 1994) and high fat diets and high blood lipids are associated with an increase in clotting activity (Miller, 1992). Therefore, as myristic acid and palmitic acid increase total plasma cholesterol and LDL cholesterol and stearic acid is thrombogenic, these fatty acids are all implicated in MI (Connor, 1996).

### **Trans Fatty Acids**

Trans fatty acids, found in dairy fats and hydrogenated oils used in solid margarine, deep-frying and processed food, increase LDL cholesterol in a similar way to most saturated fats (Judd et al., 1994) and also increase Lp (a) (Neaton et al., 1992) and lower HDL cholesterol (Katan, 2000).

In the St Thomas' Atherosclerosis Regression Study, a well-designed, randomised, controlled study of fifty men with CHD and elevated serum cholesterol given either dietary counselling or usual care, foods containing saturated fats and trans fatty acids were found to enhance coronary occlusion (Watts et al., 1996). The long chain saturated fatty acids myristic, palmitic and stearic acids and trans fatty acids from animal sources (principally trans-vaccenic

acid) were found to be atherogenic. Those eating food sources of these fats, such as dairy products and red meat, especially butter and lamb, had progression of their coronary artery disease, whereas coronary lesions stabilised in men who limited their intake of these foods. Trans fatty acids from table margarine were not found to be atherogenic in this study.

### **Unsaturated Fats**

Monounsaturated fatty acids (MUFA) have been shown to be neutral (Grundy, 1986) or to reduce serum cholesterol (Howard et al., 1995) and omega-6 polyunsaturated fatty acids (PUFA) also reduce serum cholesterol, with a stronger effect than MUFA (Howard et al., 1995). Nuts contain MUFA and PUFA and have been found to improve blood lipids and, when substituted for saturated fat, may be associated with a 45% reduction in CHD risk (Hu & Stampfer, 1999). There is some controversy about the use of large amounts of omega-6 PUFA to replace saturated fat as this can lower HDL cholesterol, which may have a negative impact on CHD (Mattson & Grundy, 1985).

### **Omega-3 PUFA**

The omega-3 PUFA from fish oils, which include alpha-linolenic acid, eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), may inhibit ventricular fibrillation, a major cause of death in patients with CHD, and are protective against cardiac arrest (Siscovick et al., 1995). Fish oils also decrease clotting, enhance endothelial function and may slow atheroma progression (Leaf & Weber, 1988). They inhibit very-low-density lipoprotein synthesis and have a powerful triacylglycerol-lowering effect in normal and hyperlipidaemic subjects (Connor & Connor, 1997) and also in combined hyperlipidaemia, when used with drugs that inhibit cholesterol synthesis such as simvastatin (Nordly, Binaa, &

Nilsen, 1998). Postprandial lipoproteins are atherogenic and thrombogenic and their release is markedly reduced by fish oil (Harris, Connor, Alam, & Illingworth, 1988).

In an Australian randomised, controlled study of men with elevated serum cholesterol, high-fat diets (40% of energy) with one daily fish meal or fish oil supplement increased all forms of cholesterol and reduced triacylglycerols (Mori et al., 1994). In the same study, diets containing 30% fat without fish or fish oil reduced all forms of cholesterol but triacylglycerols were unchanged. Diets containing 30% fat with one daily fish meal reduced total and LDL cholesterol and triacylglycerols and increased HDL cholesterol, indicating that the most protective dietary effect in this study was to add fish to a fat-restricted diet.

In a 20-year prospective study of 852 middle-aged men in the town of Zutphen in the Netherlands, those eating at least one fatty fish meal a week had a more than 50% reduction in risk of CHD mortality compared to those who did not eat fish (Kromhout, Bosschieter, & de Lezenne Coulander, 1985). An American population-based case-control study (n = 827) also found that a seafood intake equivalent to one meal of fatty fish a week was associated with a 50% reduction in risk of primary cardiac arrest (adjusted for other risk factors) and those with at least 5% of total red blood cell fatty acids as omega-3 fatty acids had a 70% reduction in risk (adjusted for other risk factors) compared to those with 3.3% (Siscovick et al., 1995). In the NHANES I study, previously described (p.7), fish intake was inversely associated with cardiac events at follow-up, especially in those with normal total cholesterol levels (Gartside et al., 1998).

Fish oil supplements have also been found protective in CHD. The Italian GISSI-Prevenzione Trial of 11,324 MI patients randomly assigned to fish oil

(1g/day), vitamin E (300mg/day) or neither for a period of 2 years found reduced all-cause and CVD deaths in the fish oil group (GISSI-Prevenzione Investigation, 1999). The protective effect of fish oil on total mortality was significant at three months and on risk of sudden death at four months but the effect on CHD deaths became significant after six to eight months. In a German randomised double-blind, placebo-controlled trial of fish oil (6g/day for three months then 3g/day for 21 months) in 223 patients with CHD, angiograms revealed a significant but modest reduction in atherosclerosis progression in the fish oil group (von Schacky, Angerer, Kothny, Theisen, & Mudra, 1999).

A systematic review of prospective cohort studies of fish intake and CHD mortality concluded that fish consumption at 40-60g daily markedly reduces CHD deaths in high-risk populations but not in those with low-risk (Marckmann & Gronbaek, 1999).

### **Cholesterol**

Dietary cholesterol, although originally considered a risk factor for CHD, has been found to have some effect on serum cholesterol in about one-third of the population and no significant effect on the remaining two-thirds (McNamara, 1995). As most of the body's cholesterol is from endogenous synthesis, researchers have attempted to determine how this is regulated. Human cholesterol biosynthesis has been shown to be influenced by dietary factors such as energy restriction, meal frequency, type of dietary fat, cholesterol content and phytosterol content (Jones, 1997). Energy restriction appeared to result in the greatest decline in serum cholesterol, supporting the observation that cholesterol levels fall with weight loss.

### **Other Dietary Factors related to CHD**

Due to the overwhelming amount of evidence implicating the amount and type of dietary fat in increasing the risk of CHD and the emphasis on dietary fat modification by advisory bodies in Australia and around the world for CHD prevention, this review will limit discussion to dietary fat. Other dietary and lifestyle factors related to CHD are beyond the scope of this review but there is some evidence that dietary factors positively associated with CHD are high carbohydrate intake as a fat replacement (Coulston, Hollenbeck, Swislocki, & Reaven, 1989; Lichtenstein & Van Horn, 1998) and excess salt (Midgley, Matthew, Greenwood, & Logan, 1996) and those negatively associated are moderate alcohol intake (Gartside et al., 1998; McElduff & Dobson, 1997), dietary fibre (Ascherio et al., 1996; Brown, Rosner, Willett, & Sacks, 1999; Pearson, LaCava, & Weil, 1997), plant phytochemicals (Tilvis & Miettinen, 1986; Hertog et al., 1993; Murkies, Wilcox, & Davis, 1998), antioxidants (Visioli & Galli, 2001; Abbey, Nestel, & Baghurst, 1993; Esterbauer et al., 1992; Brown & Hu, 2001; Rimm et al., 1993; Stampfer et al., 1993; Stephens et al., 1996) and folate (Vollset et al., 2001; Jacques et al., 2001; Bots et al., 1999).

Overall, dietary factors regarded as pathogenic for CHD are cholesterol, saturated fats, trans fatty acids and animal fats and those that are regarded as protective are PUFA, MUFA, fish, fruit, vegetables, grains, beans and antioxidants (Connor, 1996).

## **Coronary Heart Disease Risk Factors in Australia**

The prevalence of risk factors for CHD is high. In 1995, 81% of Australians had at least one modifiable risk factor, 43% had two or more and 13% had three or more (Mathur, 2002). Investigations of CHD risk factors in Australians adults aged 25 years and over, as reported by the AIHW for 1999-00, show that 42% of men and 44% of women are insufficiently physically active, 21% of men and 18% of women smoke tobacco regularly, 31% of men and 26% of women have high blood pressure, 50% of men and women have high serum cholesterol, 67% of men and 52% of women are overweight or obese and 20% of men and 22% of women are obese. Diabetes affected 7.5% of all adults and an additional 11% had impaired glucose tolerance. It is believed that diabetes rates have doubled over the last twenty years (Mathur, 2002).

An AIHW analysis of data from the most recent National Health Survey (1995) showed that Australians with heart disease were more likely to be overweight or obese, have high blood pressure and be more physically inactive than those without heart disease (Mathur, 2002).

### **Australian Food Intakes**

Data from the most recent Australian National Nutrition Survey (NNS) (1995) (Australian Bureau of Statistics, 1997) showed that mean daily intakes for men aged 19 and over were: total fat 99g/day (39g saturated fat, 36g MUFA and 15g PUFA), PUFA to saturated fat (PS) ratio 0.40, cholesterol 358mg, dietary fibre 26g and alcohol 19g. For women aged 19 and over, mean daily intakes were: total fat 68g/day (27g saturated fat, 24g MUFA and 10g PUFA), PS ratio 0.40, cholesterol 240mg, dietary fibre 20g and alcohol 7g. For men, total fat intake was 32% of energy (saturated fat 13%, MUFA 12%, PUFA 5%), carbohydrate 45%

(sugar 19%, starch 26%) and protein 17%. For women, percent fat, saturated fat, MUFA, PUFA and protein were similar but carbohydrate was slightly higher at 47%, due to extra sugar (sugar 21%, starch 26%).

Men and women aged 65 years or more ate less fat, cholesterol and alcohol but percentage intakes and PS ratio were similar to the means for those aged less than 65 years. Older men ate more fat (74g) and cholesterol (273mg) than older women (57g and 207mg, respectively). Mean meat intake for those 65 years or more was 146g for men and 95g for women, mean fish intake was 26g for men and 20g for women, mean fruit intake was 179g for men and 176g for women, mean vegetable intake was 282g for men and 244g for women and mean legume intake was 9g for men and 4g for women. Over all adult age groups, the percentage of energy from fat (32%) and saturated fat (12-13%) was higher and the PS ratio lower (0.4) than desirable.

Since the 1980s, total percentage of energy from fat has reduced (formerly 37%) as has saturated fat (formerly 16%) but it is still higher than desirable for CHD prevention (Australian Institute of Health & Welfare, 2001). Australians appear to be still eating too much total fat, saturated fat and sugar and too little PUFA, fruit, vegetables and dietary fibre, with legumes being particularly low.

### **Australian Dietary Attitudes and Habits**

There are few studies about Australian dietary attitudes and no recent studies and it is likely that attitudes have changed since the studies were undertaken. An Australian random population survey of 916 urban adults in 1988 showed that there was general concern about dietary fat (Crawford & Baghurst, 1990), with 40% of respondents citing dietary fat as the nutrient about which they were most concerned. Men were mainly concerned because of CVD (61% of

those concerned about fat) and women because of body weight (36%) and CVD (34%). In those aged fifty years or over, 55% linked dietary fat to heart disease and 24% linked it to cholesterol problems. Fifty-six percent of women and 48% of men claimed to have reduced their fat intake, however, only 17% listed CVD as a reason for changing their diet. Eighty-eight percent had experienced difficulty attempting dietary change; common reasons were lack of willpower, lack of good advice or information and lack of family support. Inconvenience, cost and taste were found to be of less importance. In a 1990 study of Australian attitudes to CVD risk factors, only nine percent of those surveyed said that they would reduce their dietary fat intake to reduce their risk of CVD (Rushworth et al., 1990). Those who had been diagnosed with elevated serum cholesterol were more likely to respond appropriately.

Again, there are few studies of dietary habits in Australians with CVD and most are not recent. In 1994, an Australian survey showed that lower than average fat intake was more common in those with a history of CVD (Baghurst, Baghurst, & Record, 1994). Another 1994 study of fat intake in Australian adults with and without a history of CHD also showed that those with a history of CHD consumed less total fat, less fat from dairy and meat and more fat from polyunsaturated margarine (Elliott, Heller, Boyle, & Dobson, 1994).

The small scale, the age and the small number of studies means that conclusions cannot be drawn. These studies imply that a history of CHD is an incentive to change to a low-fat diet, however, the diet before diagnosis of CHD was not reported. More recent surveys of people are lacking and there is no current information available on the dietary attitudes and habits of Australians with CHD.



## **Dietary Recommendations for Coronary Heart Disease**

### **National Heart Foundation of Australia**

The National Heart Foundation (HF) of Australia, in a 1992 position paper on diet and heart disease, identified the following dietary factors related to CHD: saturated fats, trans fatty acids, cholesterol, alcohol, salt, overweight and obesity (Shrapnel, Calvert, Nestel, & Truswell, 1992). A more recent HF position statement on dietary fats (1999) recommends limiting saturated fatty acids and trans fatty acids to no more than eight percent of energy intake, with omega-6 PUFA comprising 8-10% (National Heart Foundation of Australia, 1999). Additional advice is to increase omega-3 PUFA by eating at least two fish meals a week and 2g of plant omega-3 PUFA daily and replace some saturated fats with MUFA. The HF no longer regards restricting total fat and dietary cholesterol as a priority, however, recommends limiting cholesterol intake if serum cholesterol is elevated or other CHD risk factors are present.

### **American National Cholesterol Education Panel**

For elevated serum cholesterol, the American National Cholesterol Education Panel (NCEP) initial recommendations in 1998 were the Step I diet for primary prevention: total fat 30% of energy, saturated fat 10%, MUFA 10%, PUFA 10%, cholesterol <300mg/day and the Step II diet for secondary prevention: total fat <30% of energy, saturated fat <7% MUFA 10%, PUFA 10%, cholesterol <200mg/day (Expert Panel on Detection, 1988). The NCEP Adult Treatment Panel III 2001 recommendations for elevated serum cholesterol (Expert Panel on Detection Evaluation and Treatment of High Blood Cholesterol in Adults, 2001) are similar to the Step II diet outlined above and endorse the concept of therapeutic lifestyle changes (TLC). TLC include limiting total fat

intake to 25-35% of energy and keeping saturated fat and trans fatty acid intake low. Saturated fat should comprise less than 7% of kilojoules, PUFA up to 10% and MUFA up to 20%. Carbohydrate should comprise 50-60% of total kilojoules and be derived mainly from complex carbohydrate foods, especially whole grains, fruit and vegetables, and protein should comprise 15% of total kilojoules. Fibre intake should be 20-30g/day and cholesterol less than 200mg/day. Additional advice is to maintain a normal weight by balancing energy and expenditure to avoid weight gain, to lose weight if overweight, increase physical activity and to use plant stanols/sterols (2g/day) and soluble fibre (10-25g/day) if cholesterol-lowering goals are not achieved. TLC is recommended alone or with cholesterol-lowering drugs, according to the level of serum cholesterol and the success of TLC.

#### **American Heart Association**

The American Heart Association (AHA) recommendations, 2000, are to have two fish meals per week, increase fruit, vegetables, low-fat dairy products and dietary fibre (25-30g/day) and limit alcohol to 1-2 drinks/day (Krauss, Eckel, Howard et al., 2000). The most recent AHA statement on secondary prevention, 2001, recommends an intake of less than 7% saturated fat, less than 200mg/day of cholesterol and increased omega-3 fatty acids, with physical activity, weight management and drug therapy (Smith et al., 2001).

#### **European Heart Network**

The European Heart Network priority dietary goals for the prevention of CHD, 1998, are to reduce saturated fat, total fat and sodium and increase fruit, vegetables, cereals, potatoes and fish (European Heart Network Expert Nutrition Group, 1998).

## **International Task Force for Prevention of Coronary Heart Disease**

The International Task Force for Prevention of Coronary Heart Disease includes specific advice on the components of a cholesterol-lowering diet (International Task Force for Prevention of Coronary Heart Disease, 1999). Total fat should be no more than 30% of energy, made up of saturated fat 7-10%, MUFA 10-15% and PUFA 7-8%. Carbohydrates should comprise more than 50% of energy, fibre intake should be more than 25g/day and cholesterol less than 300mg/day. Specific foods recommended are whole-grains, vegetables, salads, fruit, legumes, unhydrogenated oils, especially MUFA-rich oils, low-fat dairy products, fish, skinless poultry and small amounts of lean red meat and eggs. If response is incomplete, a stricter diet should be used, comprising 25-27% fat, 6-8% saturated fat and cholesterol 200-250mg/day. If serum triacylglycerols are elevated, additional advice is to limit or avoid alcohol and sugar-rich food, increase fish intake and normalise body weight. In severe cases, medium-chain fatty acids should be used instead of long-chain fatty acids and a fat-free diet used for emergency treatment.

Overall, recommendations from each of these bodies is similar, particularly regarding the emphasis on reducing total and saturated fats. The recommendations are based on a solid body of evidence as discussed in the previous section "Dietary Factors and Coronary Heart Disease Risk" (p. 16-21). Further evidence comes from a large-scale prospective cohort study of 44,875 men without cancer or CHD (Hu et al., 2000) in which food frequency questionnaires were used to identify dietary patterns predicting risk of CHD at eight-year follow-up. Two major dietary patterns were identified: the "prudent pattern", comprising a higher intake of fruit, vegetables, legumes, whole grains, fish and poultry, and the "Western pattern",

comprising more red meat, processed meat, refined grains, French fries, high-fat dairy products, sweets and dessert. Adjusting for age and other risk factors, the relative risks of non-fatal MI and fatal CHD were lower in diets conforming to the prudent pattern, with those with the highest quintile of scores for the prudent pattern having a relative risk of CHD of 0.70. Those in the highest quintile of scores for the Western pattern of diet had a relative risk of 1.64. It was concluded that dietary pattern was able to predict risk of CHD, independent of other lifestyle variables.

## **Dietary Interventions and Coronary Heart Disease**

Intensive reduction in coronary risk factors in men and women is associated with reduced cardiac event rates in people with or without previous history of MI and with regression or reduced progression of atherosclerosis (Haskell et al., 1994). However, controversy exists about the factors responsible for the effects and about the effect on mortality.

The “diet-heart” hypothesis was developed from the studies previously discussed that found that dietary fat was implicated in CHD. This theory is that dietary fat and cholesterol leads to increased serum cholesterol and CHD and that decreased dietary fat and cholesterol leads to decreased serum cholesterol and less risk of CHD (Kwiterovich, 1997). Early studies were designed to test this hypothesis. The emphasis in dietary intervention studies has changed from cholesterol to saturated fat, as this is now considered to be the main contributor to elevated serum cholesterol. Large, long-term trials of low-fat and low-saturated-fat diets as the sole intervention are difficult to carry out as changing one component of the diet inevitably leads to changes in others, compliance may decline with time and concurrent lifestyle changes may be responsible for any beneficial effects. The focus has changed recently from diet to lipid-lowering drugs and, to determine the effect of dietary change only, the studies discussed in this section will focus on secondary prevention trials that did not use lipid-lowering drug therapy. It should be pointed out, however, that no single secondary prevention trial of sufficient size and sensitivity has been carried out to test the effectiveness of low total-fat and low saturated-fat diets as the sole intervention (Oliver, 1997).

## **Reviews and Meta-analyses of Dietary Interventions**

There are several reviews and meta-analyses that show that cholesterol-lowering diets are effective. The two most recent and highest quality reviews are described below.

A systematic review of fat-modified diets designed to lower serum cholesterol (Hooper et al., 2001) included randomised, controlled trials of low-fat diets, low-saturated-fat diets, low-cholesterol diets and diets where unsaturated fat was substituted for saturated fat. Omega-3 fats, although protective, do not lower serum cholesterol and trials of these, as well as multifactorial interventions, were excluded from the review. Twenty-seven studies were included and meta-analysis found that fat modification had little effect on all-cause mortality (2% reduction) but was associated with a 9% reduction in CVD mortality and a 16% reduction in CVD events. Trials lasting at least two years showed a stronger protective effect. The Oslo trial used some oily fish and excluding this weakened the results, which then showed no effect on all-cause mortality, a 6% reduction in CVD mortality and a 14% reduction in CVD events. Mean cholesterol reduction achieved was 11%. Both high and low risk groups had a similar level of risk reduction and the method of dietary intervention (providing all food eaten or providing dietary advice or advice with a supplement) made no difference. The differences in the types and amounts of fat in the diets used in the studies means that few conclusions can be drawn about the most effective diet but it appears that oily fish is particularly protective. The reviewers conclude that the central role of dietary fat as a cause of CVD is supported.

A 2003 Cochrane Review by the authors of the previous review and drawing information from the same 27 studies of reduced or modified fat diets for

preventing CVD concluded that there is a small but potentially important reduction in risk of CVD in trials lasting longer than two years and that lowering saturated fat intake should continue to be part of lifestyle advice for CVD (Hooper et al., 2003).

Other meta-analyses have also shown positive results. A meta-analysis of cholesterol-lowering diets that included 224 studies on 8,143 subjects in 366 independent groups predicted that such diets will reduce total serum cholesterol and LDL-cholesterol by approximately 5% (Howell, McNamara, Tosca, Smith, & Gaines, 1997). The NCEP Step I diet and Step II diet are claimed to lower serum cholesterol by 7-9% and 10-20%, respectively, with very-low-fat diets leading to reductions of 20-25% (Stone et al., 1996). A meta-analysis of thirty-seven dietary interventions using the NCEP Step I and Step II recommendations showed that Step I diets decreased total serum cholesterol by 10%, LDL cholesterol by 12%, triacylglycerols by 8% and total cholesterol:HDL cholesterol by 10%, with no change in HDL cholesterol (Yu-Poth et al., 1999). Step II diets decreased total serum cholesterol by 13%, LDL cholesterol by 16%, HDL cholesterol by 7%, triacylglycerols by 8% and total cholesterol:HDL cholesterol by 7%. There were significant associations between reduction in total dietary fat and saturated fat and reduction in total serum cholesterol, LDL and HDL cholesterol. Increased body weight was significantly associated with increased serum triacylglycerols and reduced HDL cholesterol. The reduction in HDL cholesterol is an unwanted effect of very-low-fat diets but this meta-analysis showed that the drop in HDL cholesterol could be prevented by exercise and that exercise with low-fat diets gave greater reductions in total serum cholesterol, LDL cholesterol and triacylglycerols than diet alone. Exercise and weight loss potentiated the beneficial

effects of the low-fat diets.

An earlier review of the evidence about the effectiveness of cholesterol-lowering diets has shown that reductions of 4-17% in serum total cholesterol can be achieved in people with CHD and also in those at high risk of CHD (Denke, 1995). The effectiveness of dietary therapy was found to be enhanced by the use of individualised advice, on-going follow-up and weight loss.

A general review of dietary trials for primary and secondary prevention of CHD has shown that dietary treatment gives an odds ratio of 0.94 for total deaths and 0.70 for coronary events (Truswell, 1994). In this review, four trials carried out in America, the UK and Europe (n = 275) measuring angiographic end points were analysed and, in all trials, serum cholesterol reduced and coronary narrowing either regressed slightly or progressed more slowly. However, in ten trials which used fish oil for coronary angioplasty patients, it was not always effective at preventing restenosis.

### **Secondary Prevention Trials**

#### **Singh et al**

In an Indian randomised, single-blind, controlled study of 406 MI patients (average age 52 years), patients were placed on a low-fat, predominantly vegetarian diet and given lifestyle counselling. Patients in group A (n = 204) were given additional advice to increase fruit, vegetables, nuts and grain products and were given regular dietary counselling. The group A diet was low in fat (24% of energy), low in saturated fat (7% of energy) and cholesterol (147mg/day), with a PS ratio of 1.19, and high in dietary fibre and antioxidant vitamins and minerals from fish, nuts, fruit, vegetables and spices. Patients in group B (n = 202) followed the standard low-fat diet, comprising 28% of energy as fat, 11% as saturated fat



and 287mg cholesterol, with a PS ratio of 0.64, and had no additional dietary counselling. Dietary data was collected by diet diaries completed with the help of a dietitian in hospital on days 3, 6 and 10 after the MI and then every week for six weeks, after which they were completed at varying intervals from weekly to twelve-weekly. The medical data was recorded by staff blinded to the type of dietary intervention. It was found that the group A diet, together with weight loss (mean 7.6kg), significantly reduced total serum cholesterol by 7%, LDL cholesterol by 12% and reduced fatal and non-fatal cardiac events after six weeks (Singh et al., 1992). At one year, the rate of complications was significantly lower in group A and these patients had more improvement in blood lipids, more weight loss, reduced total and cardiac mortality and fewer non-fatal MI than group B. Although this study was on an Indian population with different dietary, lifestyle and genetic factors affecting CHD risk and may have limited meaning for people in Western countries, it reinforced the importance of reducing total and saturated fat and body weight and increasing PUFA, fruit, vegetables, nuts and grains in this population.

#### Lyon Heart Study

A similar diet, but with more emphasis on the type of PUFA included, was used in the Lyon Heart Study, in which 302 post-MI men were given a Mediterranean-style reduced-fat diet (30% of energy from fat), low in saturated fat (8%) and cholesterol (217mg/day), and enriched with monounsaturated fatty acids (oleic acid, 13%) and omega-3 fatty acids (mainly alpha-linolenic acid, 0.8%) from canola oil margarine (de Lorgeril et al., 1994). Subjects were instructed to eat more bread, vegetables, legumes and fish, eat fruit daily, replace meat with poultry and replace butter and cream with margarine, canola or olive oil. The 303 controls

used the NCEP Step I diet and the PS ratio was similar in both groups at approximately 0.7. Preliminary analysis at twenty-seven months found a noticeable protective effect of the Mediterranean diet. Results at five-year follow-up showed no weight loss and no difference in serum cholesterol levels between the groups but large reductions in total mortality (56% fewer), major cardiac events (67% fewer) and total cardiac events (47% fewer) in the Mediterranean diet group.

#### Diet and Reinfarction Trial

In the Diet and Reinfarction Trial (DART) of 2,033 post-MI men, subjects were randomly assigned to no fat advice, the NCEP Step I diet, a high cereal-fibre diet (18g/day) or fatty fish 200-400g/week (Burr et al., 1989). Over two years, those eating fatty fish twice weekly had reduced all-cause mortality by 29% but no reduction in non-fatal cardiac events or CHD deaths. The NCEP Step I diet outcomes were no different to those of no fat advice. Twenty-two percent of the fish group who disliked fish took MaxEPA fish oil capsules (3g/day) and there was a significant reduction in CHD deaths and all-cause deaths after two years in these subjects (Burr, Sweetnam, & Fehily, 1994).

#### GISSI-Prevenzione Trial

The GISSI-Prevenzione Trial in Italy of 11,324 MI patients taking one fish oil capsule containing 850-882mg EPA and DHA daily or placebo showed a 20% reduction in total mortality over the three and a half years' trial in the fish oil group, independent of diet or drugs (GISSI-Prevenzione Investigation, 1999).

#### Coronary Artery Lesion Progression Trials

Studies have been carried out to assess the effect of dietary interventions on the rate of progression of coronary artery lesions.

### Leiden Intervention Trial

Two trials have tested the effect of vegetarian diets on the progression of artery wall lesions. The small-scale Leiden Intervention Trial of thirty-nine subjects, almost half of whom smoked, used a vegetarian diet with a P/S ratio of 2 and cholesterol less than 100mg/day (Arntzenius et al., 1985). After two years, none had stopped smoking but total serum cholesterol had reduced by 10%, total serum cholesterol:HDL cholesterol had reduced by 8.5% and coronary artery lesion growth had halted in about half the participants. Coronary lesion growth correlated with total:HDL cholesterol but not with blood pressure, smoking, alcohol intake, weight or drug treatment.

### Lifestyle Heart Trial

In the slightly larger Lifestyle Heart Trial, forty-eight subjects with CHD verified by angiography were given a strict low-fat vegetarian diet of fruit, vegetables, grains, legumes and soy products (less than 10% of energy from fat, P/S >1), with egg white and limited non-fat milk or yoghurt, no caffeine, limited alcohol and supplementary vitamin B12 (Ornish et al., 1990). Lifestyle change included weight loss (mean 10kg), smoking cessation, exercise and stress management. Compliance was poor but total cholesterol reduced by 24%, LDL cholesterol reduced by 37% and angiography after twelve to fifteen months showed an average 1% regression of lesions in 82% of the seven subjects who adhered to the regime. Lesions progressed in the control group.

### Heidelberg Study

In the Heidelberg Study, 113 subjects were allocated to intensive physical exercise and a low fat diet or usual care (Schuler et al., 1992). The intervention group's diet consisted of less than 20% of energy as fat, cholesterol <200mg/day

and a PS ratio of  $>1$ . After one year, total cholesterol reduced by 10%, stress-induced myocardial ischaemia decreased and artery lesions regressed in 32%, no change occurred in 45% and lesions progressed in 23%, significantly better outcomes than those of the control group. It cannot be established whether these results were due to the exercise or diet or to a synergistic effect of both interventions.

#### Monitored Atherosclerosis Regression Study

In the randomised, double-blind, placebo-controlled Monitored Atherosclerosis Regression Study (MARS), subjects with CHD ( $n = 270$ ) followed a low-fat, low-cholesterol diet and made lifestyle changes (smoking, alcohol and weight reduction) (Markus, Mack, Azen, & Hodis, 1997). Subjects were also randomly assigned to a lovastatin or placebo group and the effect on the rate of increase in carotid artery intima-media thickness (IMT) was assessed by coronary angiograms. In the 94 patients not taking lovastatin, dietary cholesterol, insoluble fibre, BMI and cigarette smoking were significant predictors of IMT and an increase in MUFA relative to saturated fat and stearic acid was a significant predictor of a reduction in IMT progression.

#### St. Thomas' Atherosclerosis Regression Study

In the St. Thomas' Atherosclerosis Regression Study, men with CHD ( $n = 50$ ) were divided into usual care, diet intervention or diet and drug (cholestyramine 8g/day) intervention (Watts et al., 1992). It was found that patients in the diet intervention group (a reduced-fat high-fibre diet, with 27% of energy from fat, saturated fat 8-10% and PUFA 8%) reduced total serum cholesterol by 14.6%, LDL cholesterol by 16.5%, triacylglycerols by 20% and total to HDL cholesterol ratio by 16%. After three years, progression of

atherosclerosis was significantly reduced in the diet intervention group and in the diet and cholestyramine group compared to the usual care group. Luminal diameter increased and the change was correlated with serum LDL cholesterol and LDL/HDL ratio. Total CVD events were significantly reduced in both intervention groups.

Although statin drugs are becoming more commonly prescribed for elevated serum cholesterol and appear to have a greater effect than dietary modification (Hunninghake et al., 1993), lipid-lowering diets augment the effect of lipid-lowering drugs (Chisholm, Mann, Sutherland, Williams, & Ball, 1993), can sometimes be as effective as drugs in certain individuals and have other beneficial effects on health apart from the effect on blood lipids (Denke, 1999).

#### Stanford Coronary Risk Intervention Project

The Stanford Coronary Risk Intervention Project (SCRIP) trial, a randomised long-term study of dietary advice (n = 246), counselling every 2-3 months and a home exercise program, together with lipid-lowering drugs, found that, after four years, serum lipids, blood pressure, BMI and blood glucose levels significantly improved, disease progression was reduced and there were fewer cardiac events (mostly percutaneous transluminal coronary angioplasty (PTCA) procedures in the first year of the study) compared to controls (Haskell et al., 1994). Results were similar or better than achieved for trials of lipid-lowering therapy only.

Overall, from the reviews previously discussed, cholesterol-lowering diets appear to reduce serum cholesterol by varying amounts, ranging from 4-25%, depending on the type of diet used. These diets also have a small effect on reducing the risk of CVD and, in patients with heart disease, reducing CHD and

total mortality and halting or regressing coronary artery lesions, with larger effects detected when diets are followed for at least two years. However, individual trials have shown conflicting results on the effect of such diets on CHD events.

Although results of cholesterol-lowering diets have been found to vary with individuals (Beynen, Katan, & van Zutphen, 1987), a trial of dietary therapy is recommended before drug therapy is initiated (International Task Force for Prevention of Coronary Heart Disease, 1999). The consensus appears to be that diet remains the cornerstone of treatment of hyperlipidaemia (International Task Force for Prevention of Coronary Heart Disease, 1999; Kromhout, 1996) but may be more effective when used with lipid-lowering drugs. Interventions for patients with CHD should include dietary modifications in line with the latest recommendations and exercise, together with lipid-lowering medication and weight loss as required, to maximise CHD risk reduction.

## Cardiac Rehabilitation

CR is a structured process of secondary prevention that begins while the patient is in hospital and continues in the outpatient phase. After decades of intensive research into all aspects of CHD, multiple risk factors have been identified and the strategies of rehabilitation have changed over the years in the light of this changing knowledge.

From the 1930s to the 1960s, prolonged bed rest and limitation of even moderate physical activity was standard treatment after MI in Australia and other Western countries. However, American research on patients with CHD in the 1950's showed that these patients were able to carry out physical tasks safely (Hellerstein & Ford, 1957). Consequently, Work Assessment Centres were set up in Melbourne and Sydney in 1961 by the Australian HF to provide rehabilitation and to assess readiness of patients to return to work. Physical activity was found to be beneficial in the recovery process and programs of high intensity exercise were set up in the 1960s -1970s.

With the subsequent identification of other risk factors, CR programs evolved to provide a formal framework for a range of secondary prevention activities. The exercise emphasis changed from intensive to light and the programs broadened to include education on medical, surgical, psychological and social elements of the disease and behaviour change for risk factor reduction. NE became an important facet of CR risk reduction as continuing research revealed connections between dietary factors and heart disease.

The World Health Organisation has stated that CR should be an integral part of the care of patients with CHD and should be available to all patients with CVD (World Health Organisation, 1993). The report of the 1994 Australian

National Health Goals and Targets Implementation (NHGTI) Working Group on CVD states that “cardiac rehabilitation is an integral part of the care of the person who has had acute myocardial infarction or has undergone coronary artery bypass or angioplasty.” (National Health Goals and Targets Implementation Working Group on CVD, 1994, p. 55). This report recommends that all people with CHD are offered, and have access to, a comprehensive CR program.

### **National Heart Foundation Recommendations for CR**

The HF also endorses these views and recommends routine referral of patients with CHD to outpatient programs (National Cardiac Rehabilitation Advisory Committee of the Heart Foundation of Australia, 1998). According to the HF, the goal of CR is to assist patients with CVD to return to an active and satisfying life and to reduce CHD risk factors and therefore prevent future cardiac events. The HF recommends that CR programs should be available to all CVD patients and that there should be routine referral to these programs. CR programs should include physical activity, health education, counselling and support for patients with CHD and their families.

The overall aims of CR as listed by the National Cardiac Rehabilitation Advisory Committee of the HF of Australia (National Cardiac Rehabilitation Advisory Committee of the Heart Foundation of Australia, 1998, p. 1), are to:

1. Maximise physical, psychological and social functioning to enable patients to live productively and with confidence;
2. Assist and encourage behaviours that may minimise the risk of further cardiac events and conditions.



Specific aims include:

1. Facilitating and shortening the period of recovery after an acute cardiac event;
2. Promoting strategies for achieving mutually agreed goals of secondary prevention;
3. Developing and maintaining skills for behaviour change;
4. Promoting appropriate use of health and community services.

There are three phases of CR: phase 1 (inpatient), phase 2 (outpatient) and phase 3 (long-term maintenance in a community setting). The phase 1 inpatient program includes mobilisation activities to regain independence in basic self-care, education, discussion, counselling, discharge planning and referral to an outpatient program.

The HF recommends a light or moderate physical activity program and an education, discussion and counselling program as the two key elements of outpatient CR programs (National Cardiac Rehabilitation Advisory Committee of the Heart Foundation of Australia, 1998).

The HF recommends that education, discussion and counselling should include the following (National Cardiac Rehabilitation Advisory Committee of the Heart Foundation of Australia, 1998, p. 4):

- Basic anatomy and physiology of the heart;
- effects of heart disease, the healing process, recovery and prognosis;
- risk factors for heart disease and their modification for secondary prevention (e.g. smoking cessation, physical activity, good nutrition, control of blood lipids, weight, blood pressure and diabetes);
- skills for behaviour change and maintenance;

- resumption of physical, sexual and daily living activities (including driving and return to work);
- psychosocial issues: mood, emotions, stress, family and personal relationships;
- medications;
- investigations and procedures; and
- individual assessment and referral to appropriate health professionals as required.

Other important components recommended by the HF for CR programs are supervision of physical activity sessions, patient monitoring, provision of emergency equipment and procedures and exercise testing, as required. The HF recommend that basic patient information should be collected for use in a national database and that program and patient outcomes should be evaluated, as CR programs should be part of an integrated monitoring system for CVD (Bennett, Dobson, & Magnus, 1995). Suggested areas for evaluation include measurement of risk factors and patient knowledge, attitudes, perceptions and behaviours.

### **CR Programs in Australia**

In 1997, there were seventy-four outpatient CR programs operating in Victoria, fifty-six of which were run by hospitals and eighteen run by community health centres, with thirty-one in the Melbourne metropolitan area and forty-three in rural centres (National Heart Foundation of Australia, 1997). There is little information on the structure of Victorian and other Australian CR programs and it is not known how closely these HF guidelines are followed. It is believed that many have funding and staffing constraints that are barriers to optimal delivery. The NHGTI Working Group on CVD (National Health Goals and Targets

Implementation Working Group on CVD, 1994) recommended standardisation of Australian CR programs to ensure consistency and assist evaluation.

The Austin Hospital in Melbourne has developed an outpatient CR program that is a model recommended by the HF and the World Health Organisation (Hare, Fitzgerald, Darcy, Race, & Goble, 1996). In this program, patients are invited during the week following hospital discharge to enter a six-week program consisting of one forty-five minute education and discussion group each week, one forty-five minute nutrition information session each week and twice weekly exercise sessions. Patients are encouraged to attend with their partner or a family member. A medical review and exercise test is carried out at the end of the program to assess progress and patients are either formally discharged or given further advice, counselling or management, as required. Specific research projects to evaluate the effectiveness of the program have been carried out on physical working capacity, mortality rates, hospital re-admission rates, lipid profiles, smoking rates, social adjustment and psychological symptoms. The participants are invited to evaluate different program components on an intermittent basis by a questionnaire.

It is not known if the Austin Hospital model of CR is representative of other programs. According to the NHGTI Working Group on CVD (National Health Goals and Targets Implementation Working Group on CVD, 1994), CR programs are unevenly distributed throughout hospitals in Australia. The Working Group reports that outpatient programs are not well developed and non-teaching and rural hospitals are limited in both inpatient and outpatient programs. Some hospitals do not have CR programs and those that do may not offer it to all patients with CHD. Less than half the patients referred to CR programs actually

attend and those that do attend may drop out before completion. Suggested causes of non-attendance are difficulties with transport, distance or disabilities or lack of belief in the value of CR. The report recommends education for patients and family on the disease process, recovery issues and lifestyle change as a minimum standard for all in-hospital CR programs. Further recommendations are that all hospitals admitting patients with CHD should offer a standardised CR program and post-hospital programs should be developed in rural areas. The report concludes that further research on the effectiveness of program elements, patient beliefs and short and long-term outcomes is essential.

### **Cardiac Rehabilitation Participation**

Patients referred to CR programs include those who have undergone treatment for MI, coronary artery bypass graft (CABG), PTCA and heart valve replacement. However, studies in Australia, the United Kingdom and the United States have shown that participation rates at outpatient CR programs are lower than optimal (Bunker, McBurney, Cox, & Jelinek, 1999; Ades, Waldmann, McCann, & Weaver, 1992b; Bethell, Turner, Evans, & Rose, 2001; Conn, Taylor, & Casey, 1992; Evenson, Rosamond, & Luepker, 1998; King, Humen, & Teo, 1999), particularly for women (Ades, Waldmann, Polk, & Coflesky, 1992c; McGee & Horgan, 1992; Tardivel, 1998). A Victorian survey of eight outpatient CR programs reported that participants (n = 240) were mainly male (72%), with a mean age of 67.5 years for women and 64.2 years for men (Bunker, McBurney, Cox, & Jelinek, 1999). Half of all the participants had experienced a CABG, 44% a MI and 6% a PTCA. Of those eligible (n = 758), only 32% attended at least the initial program session, 53% of CABG, 27% of MI and 10% of PTCA patients.

A United Kingdom systematic review of fifteen studies found that non-

attenders were more likely to be older, to have lower socio-economic status, to deny the severity of their illness and to fail to perceive that they had influence over their health outcome or that CR was recommended by their physician (Cooper, Jackson, Weinman, & Horne, 2002).

Factors affecting attendance at a rural CR program in Australia were location of the program, session times and the communication skills of staff (Thornhill & Stevens, 1998). Another Australian rural survey of 79 MI patients found that non-attenders were more likely to be older, live further away, live alone and have no access to private transport, while attenders were more likely to have been referred to the program, live closer, live with a partner and be male (Schulz & McBurney, 2000). A New Zealand study of post-MI patients aged less than 65 years (n = 143) found that CR attendance was associated with a stronger belief that the illness could be controlled or cured (Petrie, Weinman, Sharpe, & Buckley, 1996).

An American study of 393 CABG patients found that CR attenders were more likely to be male, employed, with a higher level of education and income and with only mild functional impairment (Harlan, Sandler, Lee, Lam, & Mark, 1995). This is reinforced by another American study of 3,841 patients with CHD, that found that men, CABG and PTCA patients and those better educated, employed or younger were more likely to attend CR (Evenson et al., 1998).

A Canadian retrospective study of 1,328 patients with CHD found that program attendance was 28% (King et al., 1999). Factors related to non-attendance were having a breathing disorder, being a PTCA patient or having a neurological or cognitive impairment, whereas attendance was associated with being younger, speaking English, living in a city and smoking.

An American investigation of barriers to attendance as reported by 61 program directors found that these included financial/health insurance factors (66% of program directors), lack of motivation or commitment (reported by 44%), work requirements (39%), participants already undertaking CR activities or preferring to do these on their own (31%), transport difficulties (30%), inconvenient program times (25%), participants not wanting or needing the program (15%), time constraints (10%), lack of doctor's support or referral (7%) or illness (5%) (Evenson & Fleury, 2000). An American study found that, when physician referral and financial waivers were provided, unemployment and lower education and income were still associated with non-attendance (Harlan et al., 1995). The funding for health programs is structured differently in Australia and the financial barriers reported in American studies are unlikely to be relevant.

A prospective UK study (n = 152) of illness beliefs in MI and CABG patients showed that non-attendance at CR was more likely in those who were older, less aware of serum cholesterol levels, unemployed and those who believed their illness was not controllable or lifestyle-related (Cooper, Lloyd, Weinman, & Jackson, 1999).

In an American study of 226 older patients with CHD (mean age 70.4 years), participation rates were 21%, with the most powerful predictor of attendance being the strength of the primary physician's recommendation (Ades et al., 1992b). Non-attendance was associated with greater travel time, history of depression and patient denial of the severity of their illness. In the same study, older female patients (aged 62 years or more) were found to be less likely to attend (15% attendance) than older men (25% attendance); again, the strength of the physician's referral was the main predictor (Ades et al., 1992c).

Participant dropout is a problem in CR programs. There is little information on dropout rates and reasons in Australian programs and overseas studies have methodological flaws (Daly et al., 2002), however a variety of factors have been identified. In a review of research on patient drop-out, inconvenient program location or time has been shown to be an important factor, as well as lack of attention to individual needs and inadequate leadership, progress assessment and feedback (Dishman, 1988). In an American study of 120 CR participants, health beliefs, together with demographic and health behaviour factors, were shown to predict continued attendance at a six-month CR program (Oldridge & Streiner, 1990). An American survey of 61 CR program directors has shown that reasons for dropping out included work requirements (62%), financial/insurance constraints (49%), lack of motivation or commitment (43%), illness (25%), preferring to do activities on their own (21%), time constraints (18%) or inconvenient program time (15%) (Evenson et al., 1998).

The most recent study undertaken in the UK has shown that participants suffering from depression and those having had angina or a PTCA were more likely to drop out than patients having had an MI or CABG (Turner, Bethell, Evans, Goddard, & Mullee, 2002).

### **Participant Preferences and Satisfaction with Cardiac Rehabilitation**

An American study of 65 CR participants showed that the convenience in terms of distance, transport and time, the ease of learning the exercises, the ability to choose exercises and the opportunity to discuss progress with professionals were rated as important, with men preferring to set their own goals and women preferring exercises that were not painful or tiring and less cycle and treadmill exercises (Moore & Kramer, 1996). This study also included focus group

interviews of a small sample of women (n = 10), which indicated that they appreciated being monitored while exercising, peer group support, social interaction, emotional support and pleasant, encouraging staff (Moore, 1996).

In an American study of 199 MI patients, 54% of whom enrolled in a CR program, program elements rated as most important by participants were nutritional counselling, exercise advice and long-term staff contact (Filip, McGillen, & Mosca, 1999). Younger patients (less than 65 years) rated stress management, vocational counselling and smoking cessation elements as more important than did older patients. A descriptive European study of 41 MI or CABG patients also reported that information on dietary modifications was regarded as "important" or "very important" (Ruppert, 1993).

There have been few studies assessing satisfaction with CR programs. Participants' satisfaction at one year (n = 72) following an American twelve-week out-patient program consisting of exercise, group education and individual counselling for lifestyle modification was surveyed using questionnaires designed and validated specifically for the study (Castelein & Kerr, 1995). Mean satisfaction scores for program elements ranged from 76 to 87%, with the exercise and relationship with others components rated highest (87%), followed by education (78%) and relationship with medical personnel (76%). General comments were that the caring and interest of staff and an individualised approach were most valued. More difficulty was experienced with diet, stress and hypertension management. Dietary problems were related to reducing the use of salt and using fat-reduced or skim milk and dietary compliance was most influenced by relationship with medical personnel. Main areas of dissatisfaction were with lack of professional follow-up, type of exercises and lack of flexibility of classes and



exercise sessions. However, the retrospective nature of the survey and the relatively low Cronbach alpha scores for the questionnaires, indicating less than desirable internal consistency, weaken the results of this study.

### **Cardiac Rehabilitation Outcomes**

Overall, CR programs have been found to favourably affect outcomes in patients with CHD (American Association of Cardiovascular and Pulmonary Rehabilitation, 1995). The third World Health Organisation European collaborative trial found that comprehensive CR (including exercise, education and psychological intervention) was associated with a 14% reduction in mortality (World Health Organisation, 1993). However, due to the diversity of CR programs, it has been difficult to establish which type of program or which program elements are responsible for positive outcomes. There is little information available about outcomes in Australian CR programs.

### **Meta-analyses and Reviews of CR Outcomes**

Several meta-analyses of CR outcomes have been published. The most recent was carried out by the Cochrane Collaboration (Jolliffe et al., 2001). This analysed outcomes of exercise-based and comprehensive CR (n = 8,440) and found that total cardiac mortality was reduced by 26% in comprehensive CR programs and 31% in exercise-only interventions but that there was no effect on occurrence of non-fatal MI. All-cause mortality was reduced by 27% in the exercise-only group and by 13% in the comprehensive CR group. Total and LDL serum cholesterol was significantly reduced in the comprehensive CR group only.

A 2001 review, using twelve randomised clinical trials of multi-factorial interventions for CHD (n = 9803) (McAlister, Lawson, Koon, & Armstrong, 2001), did not find a significant effect on all-cause mortality or occurrence of MI

but hospital admissions were reduced by 16%, there were moderate improvements in risk factors and there were non-significant trends towards improvement of symptoms, increased exercise tolerance and quality of life. The difference in findings may have been because most of the trials reviewed were too short to establish realistic outcomes (median follow-up one year). The authors conclude that there is an overall benefit from multi-factorial CR but the optimal mix of components has yet to be determined.

A meta-analysis of 37 studies of CR programs that included health education and/or stress management, with or without exercise training, found that CR attendance was associated with a relative reduction in cardiac deaths of 34% long-term (greater than two years), a relative reduction in MI recurrence long-term (two to ten years) and improved systolic blood pressure, total serum cholesterol, weight and smoking in the short to medium term (six weeks to two years) (Benson, 2000).

A 1988 meta-analysis of twenty studies (n = 4,347) found that participation in exercise therapy or CR programs was associated with a reduction in all-cause and CVD mortality of 20% (Oldridge, Guyatt, Fischer, & Rimm, 1988). A 1989 meta-analysis of twenty-two studies (n = 4,554), in which sixteen of the studies were common to both meta-analyses, gave a similar result: 25% reduction in all-cause and CVD mortality (O'Connor et al., 1989). No effect was found on reinfarction rates in either meta-analysis. A 1996 meta-analysis of twenty-three randomised controlled trials of CR (n = 3180) evaluating the additional effect of psychosocial treatment found that non-fatal cardiac events reduced by 46% and mortality reduced by 41% in the treatment group during the two years after CR (Linden, Stossel, & Maurice, 1996).

### Trials Reporting CR Outcomes

In a randomised study of MI patients (n = 182) aged less than 65 years, participants in a six-weeks CR program were compared to those given counselling-only interventions or usual care (PRECOR Group, 1991). There was a small but significant reduction in all-cause mortality in the CR group. A five-year follow-up study of MI patients who had attended a Swedish CR program (n = 147) found that CR participants had fewer non-fatal MI and total cardiac events and more people still at work compared to a non-CR comparison group (n = 158), although mortality rates were no different (Hedback, Perk, & Wodlin, 1993). However, after ten years, total mortality and cardiac mortality was reduced in the CR group and, among those who had not reached retirement age, more people had gone back to work.

A study of 375 MI patients in Finland, randomised to a multifactorial CR program or usual care, and followed for fifteen years, found significant reductions in sudden death and CVD mortality in the CR group but no difference in all-cause mortality or non-fatal MI (Hamalainen, Luurila, Kallio, & Knuts, 1995). However, male MI patients aged 30 to 60 years participating in the American National Exercise and Heart Disease Project (n = 651), who were given an initial eight-week exercise-only program and subsequent on-going exercise, were followed for nineteen-years and no reduction in CVD or all-cause mortality was found (Dorn, Naughton, Imamura, & Trevisan, 1999).

Trials investigating coronary atherosclerosis progression have found significant benefits from CR but, to date, the number of subjects in these studies has been small. A study of thirty-six men with atherosclerosis and not on drug therapy showed that those attending CR which incorporated dietary advice and

exercise had significantly less atherosclerosis progression, a greater decrease in serum cholesterol and better heart function during stress testing compared to controls at one year follow-up (Schuler et al., 1992) but no difference at four year follow-up. This may have been due to poor dietary compliance as increases had occurred in weight and serum total cholesterol levels (Niebauer et al., 1997). A further randomised controlled study with larger numbers (n = 113) was carried out by the same investigators using the same intervention and found less disease progression in the intervention group after six years, continued exercise having the strongest association with the improvement (Niebauer et al., 1997).

Cardiac risk factors can also be improved. A controlled trial of a nine-month CR program (n = 60) found improved fibrinolysis and increased HDL cholesterol in post-MI participants (Paramo et al., 1998). In an American outpatient CR program, participants (n = 274) showed reduced LDL cholesterol and triacylglycerols, increased HDL cholesterol, reduced BMI and percentage body fat and improved exercise capacity after rehabilitation (Lavie, Milani, & Littman, 1993). In this study, participants with the worst baseline lipid profiles had the most improvements in blood values after CR. Participants 65 years and over had similar improvements in blood lipids, obesity indexes and exercise capacity as younger participants.

In American studies, rehabilitation has been found to be significantly linked to health state and performance of exercise, diet and medication self-care (Conn et al., 1992) and CR participants were less likely to be rehospitalised and hospital costs were lower than for non-participants, indicating shorter stays and/or less expensive interventions (Ades, Huang, & Weaver, 1992a). A study in Finland showed that, after five years, CABG patients who participated in CR reported less

restriction in physical mobility compared to a usual care group (Engblom, Korpilahti, Hamalainen, Ronnema, & Puukka, 1997).

In Victoria, a survey of 1,567 CR participants found that physical and mental quality of life improved at program exit (Australian Institute of Health & Welfare, 2001) but no other relevant Australian research on outcomes could be found.

Overweight and obesity is common in the population in general and in CR participants. An American study of 449 CR participants revealed that 88% were overweight or obese (BMI  $\geq$  25) at entry and had a more adverse CHD risk profile (Bader, Maguire, Spahn, O'Malley, & Balady, 2001).

A survey of 588 patients in another American outpatient CR program revealed that 40% were obese on entry (Lavie & Milani, 1997). Obese participants had significant improvements in BMI, percent body fat, exercise capacity, HDL cholesterol, LDL:HDL cholesterol, mental health and quality of life on exit. However, other studies have shown that BMI appears to impair exercise outcomes, with obese participants having less improvement in exercise capacity compared to non-obese (Lavie & Milani, 1996) and participants with higher WHR expending less energy during exercise sessions (McConnell, Palm, Shearn, & Laubach, 1999).

In a study of 581 CR participants, all age groups improved in body composition (weight loss, reduced percent fat, increased lean body mass) during CR, except for the youngest group (40-49 years) (McConnell, Laubach, & Szmedra, 1997). Overweight patients (n = 82) given a structured weight-loss intervention in a twelve-week CR program had a greater weight loss, BMI reduction and serum cholesterol reduction than those in a standard CR program

(Savage, Lee, Harvey-Berino, Brochu, & Ades, 2002).

In an American study of gender differences in outcomes of CR (553 men and 166 women), it was found that women achieved more favourable changes in blood lipids than men at one year, with HDL cholesterol in women improving at five years, an effect not found in men (Warner et al., 1995). Women have been found to have poorer initial exercise capacity compared to men but show similar improvements after CR (Ades et al., 1992c; Cannistra, Balady, O'Malley, Weiner, & Ryan, 1992).

CR participants who have a poorer outcome regarding risk factor reduction are more likely to have less education, a lower socioeconomic background and social isolation and have more negative psychological perceptions of their disease (Ruberman, Weinblatt, Goldberg, & Chaudhary, 1984).

There are difficulties in assessing outcomes in CR programs as the programs studied varied widely in length, structure, content and delivery. As Australian CR programs are also believed to vary widely and participants' characteristics are likely to differ from those in the studies reviewed, the reported outcomes may not be relevant to Australian programs. No research to date has been able to identify the optimal CR program design and further research is needed so that standardised programs can be offered that are expected to deliver consistent outcomes. While the outcomes of Australian CR programs have not been identified as yet, research to date, based on data from overseas programs, indicates that, overall, CR programs reduce total and CHD deaths, improve cardiac risk factors and reduce hospital admissions. There is also some evidence to support a reduction in atherosclerosis progression but there is conflicting evidence about reduced cardiac events.

## **Nutrition Education for Dietary Behaviour Change**

The process of NE has been defined by Johnson and Johnson in wide-ranging review as “the teaching of validated, correct nutrition knowledge in ways that promote the development and maintenance of positive attitudes toward, and actual behavioural habits of, eating nutritious food (within budgetary and cultural constraints) that contribute to the maintenance of personal health, well-being and productivity” (Johnson & Johnson, 1985, pp. S1-2).

### **Models of Health-related Behaviour**

Education for behaviour change is believed to require an approach based on well-researched models that have been shown to be effective. There are several models that have been used to explain and predict health behaviour and an understanding of these is important in facilitating dietary behaviour change.

#### **Transtheoretical (Stage of Change) Model**

Behaviour change is believed to take place in stages (Prochaska & DiClemente, 1982). This model is called the transtheoretical or “stage of change” model and five stages are described. Stage 1: Pre-contemplation - the stage before awareness that change is desirable; Stage 2: Contemplation - when change is being considered and information is sought; Stage 3: Preparation - change is planned to start within thirty days, small changes may be initiated; Stage 4: Action - change is implemented or attempted; Stage 5: Maintenance - the new behaviour has been sustained for at least six months; Stage 6: Termination - the new behaviour is now a fixed behaviour pattern. People are believed to move through the stages in a sequential process when adopting new behaviours, with movement backwards and forward until stage 6 is reached.

The model arose out of research into addictive behaviours, such as

cigarette smoking, and may not relate well to dietary behaviour, although there are studies that have attempted to assess this. Incorrect self-classification is an important limitation of the model as, if people are unaware of what constitutes a low-fat diet, they are not able to select the correct stage and people may believe themselves to be limiting their fat intake when they are actually eating a high fat diet (Steptoe, Wijetunge, Doherty, & Wardle, 1996). Another problem with the model is that those in the action and maintenance stages have been found to be in the stages for varying periods of time with no specific cut-off point identifiable for each stage (Povey, Connor, Sparks, James, & Shepherd, 1999). However, questionnaires commonly categorise people in different stages by an arbitrary time period. Another issue is that stage of change processes may be different in such patients and, while some studies have investigated people at risk of CVD or CHD, there is inadequate research on the use of this model in patients with CHD. Intervention strategies are believed to be more effective if these are targeted to the individual's specific stage of change, however, there are few studies using staged interventions for dietary change.

No Australian studies have been identified and cultural and lifestyle differences may be expected to impact on the process of dietary change in different countries. Because of the limitations and the lack of Australian studies, it is not possible to extrapolate the findings of the studies described here from overseas populations to Australian populations.

The stage of change model has been found to correlate with fat intake in several studies. An American study of factors predicting participation in a trial of dietary fat reduction in subjects with elevated serum cholesterol (n = 8,748) found that people in the preparation stage were more likely to join the trial than those in



the pre-contemplation stage (McCann et al., 1996). In a study of stage of change in relation to adopting healthy diets, people (n = 17,121) in the first three stages (pre-contemplation, contemplation and preparation) were found to have higher fat intakes than those in the latter stages (action and maintenance) and stage of change accounted for more of the variance in nutrient intake (8-13%) than demographic characteristics or BMI (Glanz et al., 1994). Another study found that dietary saturated fat intake was lowest in subjects in the maintenance stage (Bakx, Stafleu, van Staveren, van den Hoogen, & van Weel, 1997).

Stage of change for dietary fat was found to be significantly associated with percent of calories from fat in two random samples of adults in America (n = 158 and 1,083, respectively) (Curry, Kristal, & Bowen, 1992). A study using an algorithm based on stage of change showed that those in the pre-action stages consumed more fat than those in the action or maintenance stages (Greene, Rossi, Reed, Willey, & Prochaska, 1994). Progression through the stages of change over eighteen months has been found to be associated with dietary fat reduction, with most subjects moving one stage at a time and pre-contemplators and contemplators showing the least progression (Greene & Rossi, 1998).

A survey of American CR participants (n = 226) on entry to the program showed that over three-quarters were in the action and maintenance stage of dietary fat reduction but eighty-one percent were only in the pre-contemplation or contemplation stage for increased fruit and vegetable intake (Frame, Green, Herr, Myers, & Taylor, 2001). Sociodemographic variables were not found to be related to stage of change.

A telephone survey of Canadian women (n = 491) found more positive attitudes to reducing fat intake in those in the maintenance stage compared to

those in the pre-contemplation stage (Ounpuu, Woolcott, & Green, 2000). An American cohort telephone survey of dietary change related to reducing fat and increasing fruit and vegetables over a two year period (336 men and 502 women) showed that women, those better educated, those in the maintenance stage of change and those who believed that there was a strong relationship between diet and cancer made the greatest self-initiated improvements (Kristal, Hedderson, Patterson, Neuhouser, & Neuhouser, 2001). In this study, use of food labels was strongly associated with fat reduction.

Dietary interventions based on stage of change have been found to be associated with reduced fat intake. A Dutch randomised study of patients with elevated risk of CVD, using dietary interventions matched to the subject's stage of change, found that, at six months and twelve months follow-up, the intervention group had a greater reduction in fat intake than the group given usual care but serum lipids were no different between the groups at twelve months, possibly indicating inaccuracy of self-reporting (van der Veen et al., 2002). A UK small-scale, randomised, controlled trial of 67 subjects with impaired glucose tolerance used dietary interventions matched to stage of change over a six-month period and found a significant reduction in fat intake compared to controls (Oldroyd et al., 2001). A UK randomised, controlled trial of people at increased risk of CHD (n = 883), randomised to brief behavioural counselling based on stage of change or usual health promotion, found that the behavioural intervention significantly increased the move into the action stage of change for fat reduction (odds = 2.15) and self-reported fat intake reduced (Steptoe, Kerry, Rink, & Hilton, 2001).

A small comparison group study of undergraduates in an introductory nutrition science course used pre-action stage instruction given in eleven sessions

over fourteen weeks for the experimental group (n = 38) and pre- and post-test (n = 30) or post-test only (n = 42) for the comparison groups (Finckenor & Byrd-Bredbenner, 2000). The results showed that the experimental group and the pre-test post-test comparison group increased their mean stage of change and reduced their fat intake at post-test but only the experimental group was found to have maintained the changes at one-year follow-up. However, the non-randomised selection process and the differences in age, sociodemographic profile and health status between CR patients and the groups in this study means that these results are unlikely to be relevant to CR participants.

The stage of change model has been incorporated into the Australian Cardiac Rehabilitation Association's recommendations for facilitating behaviour change in CR programs (Australian Cardiac Rehabilitation Association, 1999). The strategies recommended are similar to those promoted by Hunt and Hillsden, who have incorporated the Stage of Change model into a handbook for professionals about strategies for changing eating and exercise behaviour (Hunt & Hillsden, 1996). They suggest that people in the pre-contemplation stage need to become aware of the health risks and benefits and that health outcomes need to be personalised. Contemplation strategies should emphasise the positive effects of dietary change and aim to identify and minimise barriers and increase self-confidence. Preparation strategies would need to encourage commitment, goal-setting and contracting and give specific information on the dietary changes to be implemented. Action strategies should provide encouragement, positive reinforcement and problem-solving support. Maintenance strategies should provide on-going support, reviews of progress, positive reinforcement and re-evaluation if dietary behaviours lapse.

### Health Belief Model

The “health belief” model (Rosenstock, 1974) is another well-accepted model that attempts to explain why people may or may not practice health behaviours. In this model, there are two important factors: the personal belief that health is threatened and the belief that a specific behaviour will reduce the threat. Perception of a health threat depends on the value a person puts on health and specific beliefs about vulnerability to the health disorder and the severity of the disorder. The perceived benefit of the new behaviour is weighed against the cost. CR participants would be expected to understand the severity of their disease and, in applying this model, the connections between diet and heart disease would need to be emphasised, the beneficial outcomes of recommended diets stressed and barriers to dietary change minimised.

It would be expected that CR participants would be motivated simply by having a life-threatening illness. Knowledge of serum cholesterol has been found to be important in motivating dietary change (Aubin, Godin, Vezina, Maziade, & Desharnais, 1998; Rushworth et al., 1990). MI has been found to stimulate dietary changes (Sivarajan et al., 1983) and fear of heart surgery is a strong motivator for dietary compliance (Falk, Bisogni, & Sobal, 2000). MI patients have been found to make more dietary changes than PTCA patients (Gaw-Ens & Laing, 1994). However, in the health belief model, if patients do not believe that their heart disease is related to their diet or is amenable to dietary modification, they would not be motivated to make changes and, therefore, would need to be given convincing evidence of the link.

A New Zealand study of beliefs of MI patients (n = 143) about their illness showed that beliefs have an important influence on the recovery process, with

more negative beliefs about the prospect of recovery associated with slower resumption of normal activities (Petrie et al., 1996). In this study, beliefs appeared to be formed before the illness and remained consistent and largely unaffected by information provided during the recovery process. Perceived susceptibility to CHD, the seriousness of the illness, general health motivation, social support and knowledge of CHD risk factors were associated with preventive behaviours in American women with CHD (n = 178) (Ali, 2002).

In a study of beliefs about the causes of heart attack in 1283 survivors of MI in the United Kingdom (Greenwood, Packham, Muir, & Madeley, 1996), only 17% believed that dietary factors contributed to their heart attack. Sixty-six percent nominated stress or worry, 22% smoking, 15% excess dietary fat, 12% obesity, 7% hereditary influences, 6% lack of exercise and 2% excess dietary sugar (patients could nominate more than one cause). In those over 60 years, only 12% believed that excess dietary fat was a cause. Other older studies have also shown that stress is often perceived as the main cause (Abbott & Berry, 1989; Davison, 1980). With increasing education about other lifestyle factors affecting CHD risk, beliefs about causes may have changed in the intervening years and more recent research is needed.

#### Cognitive Social Learning Theory (Self-efficacy) Model

For the health belief model to predict behaviour, barriers to change must not outweigh the benefits and people need to have confidence that they can perform the new behaviour (Lorig, 1996). “Cognitive Social Learning Theory” attempts to predict and explain human behaviour by viewing behaviour as an interaction between the individual, their cognitive and emotional processes and their environment (Bandura, 1986). A key concept in Social Learning Theory is

“self-efficacy”, which is the confidence to perform a specific new behaviour.

Self-efficacy and beliefs about the effectiveness, desirability and ease of adopting the behaviour have been found more predictive of behaviour change than the health belief model (Strecher, DeVellis, Rosenstock, & Rosenstock, 1986).

Self-efficacy has been found to predict plasma cholesterol change in a small Australian community study (n = 34) (Van Buerden, James, Christian, & Church, 1991) and more positive beliefs and expectations were related to lower dietary fat and higher fibre intake in another Australian study (n = 874) (Smith & Owen, 1992).

In the Dietary Alternatives Study of 531 men with elevated serum LDL-cholesterol, self-efficacy measured at the end of an eight-week dietary education program was related to adherence to low-fat, low-cholesterol diets (assessed by four-day diet records and percent reduction in LDL-cholesterol) during the first year of follow-up (McCann, Retzlaff, Dowdy, Walden, & Knopp, 1990). A UK randomised, controlled trial comparing different educational methods for dietary fat reduction in subjects with elevated cholesterol (n = 291) found that self-efficacy and beliefs about the benefits of reducing fat intake were related to baseline fat intake and changes in these parameters were associated with changes in fat intake (Steptoe, Doherty, Kerry, Rink, & Hilton, 2000)

Self-efficacy can be enhanced by skills mastery, modelling, reinterpretation of physiological signs and symptoms and social persuasion (Lorig, 1996). Skills mastery is implemented by breaking tasks into small, manageable components and assisting participants to complete each stage successfully. Modelling involves demonstrating that someone with the same problem has managed it successfully and can be carried out by using participants to generate suggestions for problem-

solving and by guest speakers, videos, tapes and written literature. Participants' beliefs about their heart disease need to be identified and, if these are counterproductive or erroneous, reinterpreted in a more appropriate manner. Social persuasion involves setting short-term, realistic goals for participants and providing encouragement and support.

### Theory of Reasoned Action Model

These models assist understanding of behaviour change but may not always predict this change. A more direct predictive link has been found between the intention to perform a behaviour and the behaviour. The "Theory of Reasoned Action" (TRA), proposed by Ajzen and Fishbein (Ajzen & Fishbein, 1980), is based on this concept and has been applied to a range of food choice issues. This theory applies to behaviour that is under individual control and argues that intention to perform a behaviour is the best single predictor of behaviour. Intention is an outcome of the person's own attitude to the behaviour and perceived social pressure (termed the "subjective norm") to behave in this way. Attitude is predicted by the individual's beliefs about the outcomes of adopting the behaviour and their evaluation of these outcomes. The subjective norm is predicted by the perceived social pressure on the individual and his or her motivation to comply with this pressure. Other influences are expected to act through these variables rather than independently, although perceived control over the behaviour has been incorporated as an independent factor into an updated version of this model now termed the "Theory of Planned Behaviour" (Ajzen, 1988).

The TRA model has shown good predictive power for different types of health behaviours (Ajzen & Fishbein, 1980) and this theory has been used to show strong relationships between attitude and food choice (Shepherd, 1989; Shepherd

& Stockley, 1987). The model has been used to attempt to define the relationship between knowledge, attitude and behaviour. However, most studies of the TRA model have been undertaken in normal populations and the knowledge, beliefs and attitudes of patients with CHD may be considerably different.

The TRA model was used in a United Kingdom study of people employed by a large insurance company (n = 538) to determine whether there were links between nutrition knowledge, attitudes and dietary fat intake (Shepherd & Towler, 1992). The study is limited in usefulness because subjects were not randomly selected and data related to intake of meat, meat products, dairy products and fried foods only. Nutrition knowledge was found to be poorly correlated with attitude but there were clear relationships between attitude, intention and self-reported behaviour. Beliefs about the health of foods and taste were found to be the most strongly linked to intention and intake regarding fat, with expense and convenience less strongly linked. In an Australian population survey (n = 916), body weight, as well as health, were found to be important factors affecting fat intake, with taste being a minor consideration (Crawford & Baghurst, 1990).

An Italian study of the TRA model as it applies to food intake surveyed 1200 households and found that habit was the strongest predictor of food consumption, with intention only linked to consumption of butter and oil, and, overall, the model's ability to predict consumption was poor (Saba, Vassallo, & Turrini, 2000). In an American telephone survey of 300 males aged 35 to 55 years without diagnosed CVD, attitudes and dietary fat intake were significantly related (Terry, Oakland, & Ankeny, 1991). More positive attitudes to low-fat diets were related to higher education and occupation level, involvement in food and shopping and diagnosis of elevated serum cholesterol.



There are very few studies using the model in patients with elevated risk of CHD. A randomised, controlled Canadian study of the TRA model (n = 391) found that knowledge of total serum cholesterol has an immediate influence on patients' stated intentions to adopt a low-fat diet and resulted in reduction in fat intake at three-months follow-up, with greater reduction in those with more elevated serum cholesterol (Aubin et al., 1998).

The subjective norm (perceived social pressure) has not been found to be relevant to fat intake in some studies (Shepherd & Stockley, 1987). However, other studies have shown that social acceptability (the perception that a low-fat diet is 'normal' ) is strongly associated with following such diets (Kristal, Bowen, Curry, Shattuck, & Henry, 1990). Intention to adopt a low-fat diet was investigated in a cross-sectional survey of Canadian men (n = 1839) aged 30 to 60 years and stronger intention was associated with approval by those important to them, awareness of the advantages of the diet, having a positive attitude to the diet and having a perception they were in control of dietary behaviour (Nguyen, Otis, & Potvin, 1996). In follow-up studies of patients with CHD, attitude and the subjective norm (social support) was found to be predictive of dietary compliance at two years (Miller, Wikoff, Garrett, McMahon, & Smith, 1990) and attitude and perceived beliefs of others were associated with dietary compliance at one year (Miller et al., 1989).

While attitude and the social norm appear to relate to eating habits, the relationship of knowledge to eating habits is not as clear. Attitudes to food and perceived difficulty in changing the diet have been found to be more important than knowledge (Shepherd & Towler, 1992; Wright, 1994). Increased health knowledge does not guarantee behaviour change (Barbarowicz, Nelson, DeBusk,

& Haskell, 1980; Scalzi, Burke, & Greenland, 1980; Sivarajan et al., 1983) and nutrition knowledge has been found to correlate poorly with dietary behaviour (Axelson, Federline, & Brinberg, 1985) and fat intake (Shepherd & Stockley, 1987) but weaknesses of the studies include lack of relevance to CR subjects and the use of unvalidated measures (Wardle, Parmenter, & Waller, 2000).

Some studies have shown that dietary behaviour is associated with knowledge. The public's knowledge of dietary fat is poor (Buttriss, 1997) and it has been shown that people have difficulty estimating their fat intake accurately (Paisley, Lloyd, Sparks, & Mela, 1995). A higher knowledge level was found to be associated with reduced fat intake in 97 women aged 45-59 years (Kristal et al., 1990) and, in a study of 1,040 adults in the United Kingdom, knowledge was significantly associated with healthy eating, as defined by fruit, vegetable and fat intake (Wardle et al., 2000). A study of post-MI men showed that those who perceived their pre-MI diet to be unhealthy were more likely to want to change, showing the importance of knowledge about healthy diets (Newens, McColl, & Bond, 1997).

The only Australian study in this area was designed to determine the effect of socioeconomic status on dietary knowledge and intake (Turrell, 1997). Subjects were randomly selected from the electoral roll (n = 343), classified into groups by education status, surveyed by post and compared to a low socioeconomic group (n = 70). Those with higher education were found to have better knowledge and healthier diets but the questionnaire items used were based on food preparation methods rather than frequency of eating foods, which can lead to misleading answers, eg for the item relating to frequency of steaming fresh vegetables, a subject would have a poor score if they never steam fresh vegetables, whereas, in

reality, they may eat their fresh vegetables raw in salads. Some items had limited importance in terms of health effects e.g. peeling the skin off carrots or potatoes before cooking them.

There is only one published meta-analysis related to dietary knowledge, attitude and behaviour and this is a 1985 meta-analysis of thirty-eight studies of NE programs (Johnson & Johnson, 1985), which showed a large overall correlation for knowledge and behaviour ( $r = 0.50, p < .01$ ). The programs included for analysis differed widely in type of subjects, structure and educational methods used and it is expected that many changes have occurred in NE programs since the meta-analysis was undertaken.

The conflicting results from the studies reported above may be because some studies have investigated knowledge as a predictor of dietary change when it may be more important after dietary change has occurred for the process of following a healthy diet (Kristal et al., 1990). The degree of relationship between nutrition knowledge, attitude and behaviour remains controversial but Johnson and Johnson state in the conclusion to the meta-analysis that, in spite of this uncertain relationship, using knowledge, attitude and behaviour measures to evaluate NE is strongly supported by educational theory and that curriculum and instructional methods need to be designed to have positive effects on these key parameters.

A review of studies that used behavioural models to predict intake of fat, fruit and vegetables (Baranowski, Cullen, & Baranowski, 1999) was not able to identify one model that was a better predictor than any other, although prediction improved when targeting specific foods such as milk or salad. The review suggests using longitudinal study designs, non-self-reporting of dietary behaviour to add to the self-reported data, taking the characteristics of the subject group into account

and combining elements of different theories to create a more comprehensive model.

Given the inadequacy of the research to date, it would be prudent to use well-accepted adult educational strategies for NE in CR programs and incorporate elements of behavioural approaches that have been shown to be helpful, rather than rely totally on one behavioural model which future research may show to be inappropriate for this population.

### **Recommended Educational Strategies for NE**

Short-term goals of NE, as defined by Johnson and Johnson, include mastering nutrition knowledge, building conceptual frameworks, developing positive attitudes, consuming nutritious foods and using nutrition knowledge to make wise food choices. Long-term goals include using conceptual frameworks in decision making, seeking out further nutrition knowledge and continuing to select and consume nutritious food throughout life.

Adult learners have a need for independence and self-direction and learn better when the information is relevant to past experiences and social roles (Padberg & Padberg, 1990). Knowledge and understanding precede adoption of new skills in a step-wise progression that includes believing that the behaviour is important and possible, learning new skills, seeing proof of achievement, practising skills regularly and adopting the behaviour as a natural part of lifestyle (Girdano & Dusek, 1988). Participants' individual goals need to be addressed and the participant viewed as a colleague in the learning process (Storlie, 1981).

There are few studies on the type of teaching preferred by patients with CHD but one American study found that patients (n = 125) preferred structured, detailed teaching, with use of oral and visual teaching methods (Merritt, 1991) and

another study found a preference for written handouts (Murray, 1989).

Lorig recommends that participants' beliefs are identified early in the program and the information framed to match participants' concerns (Lorig, 1996). Lorig claims that incorrect beliefs or practices should only be challenged if they are causing harm as it is easier to add new beliefs than to destroy or change them. It is important to be selective about the information taught and to reward those taking positive actions, not those who persist in negative actions or inaction.

The traditional NE approach in health-care settings is for a series of single-topic lectures given by different experts but this format is unlikely to result in behaviour change (Lorig, 1996). Lorig recommends that one facilitator should be used, with a structured session format and several different topics per session to allow the building of skills from week to week and feedback on problems encountered. This is supported by other research showing that single education sessions are unlikely to be effective because of poor learning and retention (Burke, 1981), although the timing of the session may improve the outcome. Education given at times of severe stress, such as prior to surgery, is less effective (Cupples, 1991).

Johnson and Johnson have identified factors that assist in the achievement of nutrition goals. These include adopting and conforming to the norms of a reference group, making a public commitment to new attitudes and behaviours, being exposed to credible role models, being given vivid and personalised information, being actively involved in the learning process, passing on the information learnt to others, developing continuing motivation to learn about nutrition and being given NE in terms of personal benefits and costs. Aspects of successful instructional methods include encouraging individual participants to

recognise problems and identify solutions, linking nutrition facts to participants' experiences, using small group discussions to generate commitment to change and coordinating activities with other community initiatives.

A wide-ranging review of 217 NE intervention studies in American populations was conducted, with the aim of determining general effectiveness, successful educational strategies and the implications for future interventions (Contento et al., 1995). This review reports that dissemination of information and teaching of skills are not very effective at bringing about behaviour change. The interventions often claimed to be applying the knowledge-attitude-behaviour model of behaviour change but, in reality, were disseminating information about such topics as food groups, balanced diets, label reading, food shopping and food preparation skills. These topics are practical and essential but do not motivate participants to change attitudes and behaviour. This type of education is believed to be effective only in participants who are self-selected and motivated. As CR participants choose to attend CR and would be expected to be highly motivated, knowledge may be a more important factor in this group. The review found that successful programs included motivators and reinforcers that had personal meaning to participants, personalised self-assessment of dietary behaviours and active participation in practical activities relating to food, diet analysis and goal-setting. Adults and older adults were found to benefit from strategies that increased self-efficacy.

NE requires a conceptual framework to maximise effectiveness, incorporating the following (Contento & Morin, 1986):

- Assessment of the needs and interests of all participants and contributors;
- Selection of an appropriate theoretical NE model;

- Formulation of program goals, objectives and content;
- Design of learning experiences;
- Design of evaluation processes.

Five key principles of patient education have been identified (Mullen, Mains, & Velez, 1992), p.160:

1. Reinforce positive behaviour;
2. Offer feedback;
3. Individualise the education program;
4. Facilitate behaviour;
5. Ensure the content and educational methods used are relevant to the learner.

An example of a behavioural approach to dietary modification is the Northwest Lipid Research Clinic Dietary Alternatives Study of 531 men with elevated serum cholesterol, in which a weekly NE session was offered for eight weeks (McCann et al., 1990). Educational strategies included increasing knowledge about healthy eating, facilitating change through goal-setting and self-monitoring, including spouses or partners and enhancing self-efficacy by identifying and mastering situations that may lead to dietary lapses. Unfortunately, outcomes have not yet been reported.

## **Nutrition Education in Cardiac Rehabilitation Programs**

General recommendations are that NE in CR programs should aim to increase participants' dietary fibre intake and reduce intake of saturated fats, cholesterol, simple sugars, sodium, alcohol and total kilojoule consumption to maintain ideal body weight (Jowett & Thompson, 1989; Wagner & Williams, 1987). Family involvement in dietary change should be emphasised (Wagner & Williams, 1987).

### **National Heart Foundation of Australia Recommendations**

The HF has assisted in the initial set-up and subsequent development of most Victorian CR programs and its recommendations have been used as the basis of program design. The HF recommends group education sessions for CR programs and NE objectives are listed as (National Heart Foundation, 1993, p. 4):

1. To determine current knowledge of the link between diet and heart disease;
2. To clarify, reinforce and increase knowledge of this area;
3. To encourage participants to modify their diet;
4. To introduce participants to ways they may modify their diet.

### **Australian Cardiac Rehabilitation Association Recommendations**

The Australian Cardiac Rehabilitation Association recommends a patient-centred approach, using stage of change theory, self-efficacy theory and goal-setting to guide interventions (Australian Cardiac Rehabilitation Association, 1999). Facilitated group sessions with a group leader and group-led discussion is preferred over formal instruction. Education should be based on adult education concepts that respect the learner as a responsible, self-directing individual with valuable life experiences. Education should be problem-centred rather than topic-centred, with mutually-agreed learning needs. The Association recommends



identifying an individual's stage of behaviour change, educational level, current knowledge and readiness to learn and encouraging application of new skills to real-life situations, family involvement and relapse management. Positive reinforcement, feedback, setting of achievable goals and use of rewards are suggested strategies. Use of written materials and audio-visual media are also recommended to assist learning and the emphasis is on individualising the education process.

### **Heart Research Centre Recommendations**

In 1999, the Heart Research Centre produced Best Practice Guidelines for CR, in conjunction with the Victorian Government (Goble & Worcester, 1999). Recommendations for education and counselling for patients with CHD are that this should be conducted in groups twice-weekly over four to eight weeks and used with individual counselling as required. Scientifically-accurate information relevant to patients should be provided and adult learning principles should be followed, interactive discussion encouraged and behavioural principles, including goal setting and monitoring, be used. Facilitators should be appropriately trained and form part of a multidisciplinary team.

The Heart Research Centre recommends more emphasis on increasing behaviour change skills rather than knowledge, however, the type of behavioural approach to be used was not identified because of the lack of research in CR populations.

### **American Heart Association Recommendations**

The American Heart Association, 2000, has identified core components of CR programs and recommendations for nutritional counselling (Balady et al., 2000). Core components are patient medical assessment; nutritional counselling;

management of lipids, hypertension, weight, diabetes and psychosocial factors; smoking cessation; physical activity counselling; and exercise training.

Recommendation for nutritional counselling are to assess the patient's intake of kilojoules, fat, saturated fat, cholesterol, sodium and other nutrients; assess eating habits, meal patterns and alcohol intake; assess target areas for nutrition intervention, taking into account co-morbidities; prescribe dietary modifications in line with the NCEP Step II diet; individualise the advice according to specific targets; and educate the patient about goal-setting and strategies for attaining goals, using behaviour change models and compliance strategies. Expected outcomes of nutritional counselling are that the patient should comply with the prescribed diet, understand basic cardiac diet principles and have prepared plans to address problem eating behaviours. Nutritional counselling is also an integral part of several other core components of CR programs such as hypertension management, in which it is recommended that body weight, sodium and alcohol intake need to be addressed; diabetes management, in which body weight and diet need to be addressed; and weight management, in which the energy content of the diet needs to be addressed.

### **American Association of Cardiovascular and Pulmonary Rehabilitation**

#### **Recommendations**

Recommendations are that elements of a successful behaviour change program for CR should include (Miller & Taylor, 1995):

- Positive, accurate expectations about results - information on health benefits and time-frame of expected results;
- Precisely defined, individualised behaviour changes - identification of the individual's diet and the changes needed;

- Realistic goals - establishment of long-term goals such as serum cholesterol lowering or weight loss and short-term goals involving desired eating behaviours;
- Contracting - written contract or agreement to formalise the commitment to change;
- Prevention of lapse and relapse - identification of situations/feelings that may cause a lapse and formulation of coping strategies;
- Modelling - observation of others performing healthy eating behaviours;
- Prompting - use of reminders to prompt behaviours;
- Feedback - feedback from a health professional about progress;
- Problem solving - identification of difficulties and solutions;
- Rewards - use of material rewards or praise;
- Social support - promotion of encouragement from family and friends.

### **Nutrition Education in Australian CR Programs**

There is limited current information on NE in Australian CR programs. In 1986, a survey of all CR programs in Australian hospitals (n = 153) was carried out (Worcester, 1986). This survey reported that thirty of the hospitals surveyed failed to give any details about dietary services and, of those who provided data, 68% stated only that a dietitian was available to cardiac outpatients. Nineteen percent of hospitals surveyed regarded education programs as deficient, dietary advice was frequently described as "inadequate" and patients often received conflicting advice from other health professionals, yet education was considered to be crucial by 61% of hospital respondents. In a description of the Austin Hospital CR program, Hare (Hare et al., 1996) reports that NE takes the form of one semi-structured 45-minute nNE session each week for six weeks, emphasising selective,

appropriate and achievable dietary change. However, the paper does not discuss topics covered, strategies used to achieve change or outcomes. Information on NE in other Victorian CR programs is lacking, although it is probable that the dietary risk factors identified by the HF would be covered. Reducing total and saturated fat is likely to be emphasised, given the large body of evidence about the link with CHD. A search of the literature has not revealed information on the amount of time devoted to NE in each program, topics covered and delivery strategies in Victorian CR programs.

### **Effectiveness of Nutrition Education in Patients with CHD**

Most of the research in this area is from overseas studies and may have limited relevance to Australian CR patients.

A Canadian study reported that MI and PTCA patients make considerable dietary changes post-hospitalisation (Gaw-Ens & Laing, 1994) and inpatient dietary advice may contribute to this change. A study of 50 male MI patients in Finland found that almost all (96%) had reduced their fat intake after diagnosis and before exposure to inpatient CR (Koikkalainen, Mykkanen, Julkunen, Saarinen, & Lappalainen, 2002). Therefore, it appears that many CR participants reduce their fat intake prior to entry to the program. The initial phase of dietary change has been characterised as the “immersion phase” in which participants suspend their previous dietary habits, make wide-spread changes and adhere fully to guidelines, moving into a transition phase at about three months in which adherence tends to deteriorate (Falk et al., 2000).

Dietary compliance is difficult to assess as most studies rely on self-reported dietary intake and few have used objective measures such as serum lipid levels. A 1980 review has estimated that compliance with diets for CHD varied

between 13-76% (Glanz, 1980) but this information is now very outdated. Poor compliance was shown in a more recent Swedish study, in which lifestyle improvement and dietary advice given by primary-care medical personnel aiming to reduce saturated fat to less than 30% of energy intake, to have a PS ratio of 1.0 and to reduce daily cholesterol intake to less than 300mg was unsuccessful in terms of cholesterol-lowering due to poor compliance (Lindhölm et al., 1995). A review measuring serum lipids as an assessment of dietary adherence also found poor compliance (Carmody, Matarazzo, & Istvan, 1987).

A Tasmanian survey of people selected randomly from electoral rolls found that 11% of people were on a diet to lower serum cholesterol (Woodward, Cumming, & Ball, 1995). These people were more likely to be older, less educated, to have been diagnosed with CVD or to have had a close relative affected by heart attack or stroke. However, only 40% of survivors of MI and 43% of people diagnosed with elevated serum cholesterol reported following such a diet.

Compliance with diets for CHD appears to decline over the long-term when intervention ceases. Monitoring of the special intervention group in the six-year MRFIT study showed that 40-60% of participants were good or excellent adherers to diets for CHD although adherence declined over time (Van Horn, Dolecek, Grandits, & Skweres, 1997). Adherence was better in older men, in non-drinkers, in non-smokers, in those under less stress, in men who ate at home more often, in less overweight men and in those with higher serum cholesterol and blood pressure.

In a study of 120 subjects aged 18-70 years with borderline-high serum cholesterol levels, 80% felt that they could follow a lipid-lowering diet while

attending a 12-week dietary counselling program but only 30% reported dietary compliance during the six months following the program when no intervention was offered (Henkin, Garber, Osterlune, & Darnell, 1992). Of those who achieved the greatest reduction in dietary fat during the program, 52% maintained this initial reduction. Non-compliance was reflected in increases in serum cholesterol (total serum cholesterol increased by 19%, LDL cholesterol by 16%, VLDL cholesterol by 66%) and regain of 40% of lost weight. Kushner (Kushner, 1993), in a review of this study, concludes that non-compliance was likely to have been due to lack of motivation as participants were apparently healthy and may have had negative beliefs about the importance of the diet. Also, feedback was not given about the effects of the diet on blood lipids, participants made no commitment to adhere to the diet and on-going monitoring was not provided.

In CR participants, there are conflicting reports about dietary compliance. In a five year follow-up of a comprehensive six-month CR program in Scandinavia, participation was linked to significant improvement in cardiac health knowledge and modification of dietary habits (Lidell & Fridlund, 1996). A study in the Netherlands on dietary compliance found that patients with CHD receiving two individual counselling sessions and two group health education sessions as inpatients and then contacted weekly by phone for six weeks reported a significantly greater improvement in eating habits than a control group (Van-Elderen-van-Kemenade, Maes, & Van-den-Broek, 1994). A survey of CR program participants at one year and six years and found that reduced fat intake observed at one year was largely maintained at six years (Reid & Mulcahy, 1987). Participants who had not reduced their fat intake at one year showed little change at six years.

Dietary compliance was poor at a twelve-month follow-up of American CR program participants (Castelein & Kerr, 1995) and Worcester (Worcester, 1986) reports on an unpublished Australian study showing non-compliance with recommended weight loss and diets low in cholesterol after myocardial infarction. A Swedish study of 118 middle-aged men at risk of CHD showed that poor compliance is more common in younger patients and was also linked to lack of belief in the importance of diet for heart disease (Naslund, Fredrikson, Hellenius, & de Faire, 1996).

As CR programs vary in the amount of NE time and the content, educational methods and format, it is difficult to make comparisons between types of NE. However, a meta-analysis of eleven controlled trials and four one-group pre-test-post-test trials investigating the effectiveness of cardiac patient education determined that patients given education that included dietary information had a 14% improvement in diet over controls (Mullen et al., 1992). There were no significant differences between behavioural versus didactic teaching methods. Number of contacts and total contact hours were not significant factors in improving effectiveness. The heterogeneity between the trials, the inclusion of non-randomised, non-controlled trials and the small number of subjects in most trials analysed limit the usefulness of the results of this meta-analysis.

A more recent review of behavioural intervention studies (n = 92) aimed at increasing fruit and vegetable intake and modifying dietary fat intake found that that, overall, positive changes were achieved, with better results in those with a diagnosed disease or at elevated risk (Ammerman, Lindquist, Lohr, & Hersey, 2002). Two interventions that appeared to be particularly helpful were goal-setting and the use of small groups. A UK randomised, controlled trial of behavioural

counselling compared to standard advice for reducing dietary fat in subjects with elevated serum cholesterol (n = 291) found that behavioural counselling was more effective than standard dietary advice (Steptoe et al., 2000).

A very small-scale Canadian study (n = 32) of two CR programs that were identical except for NE methods found no difference in knowledge scores between the two programs but differences in fat intake outcomes (Travers, Tan, MacCleave, Murphy, & Whiting, 1992). The intervention program using active participation and encouraging personal responsibility, decision-making and problem-solving was more effective at reducing fat intake at the end of the program (six weeks) and at one year follow-up than the control program based on disseminating information but fat intakes were similar for both groups at two-year follow-up. A similar, more recent, controlled American study with larger numbers (n = 104) compared CR participants exposed to one individual dietary counselling session, in addition to two standard NE group classes, with participants exposed to only standard NE group classes. The individual counselling group had a greater self-efficacy and better scores for eating away from home but diets in both groups improved and there were no significant differences in saturated fat and cholesterol intake between the groups at the end of the program at six weeks or at three-month follow-up (Timlin, Shores, & Reicks, 2002). The lack of effect may have been due to the limited nature of the behavioural intervention.

In an Australian randomised, controlled trial of patients after CABG (n = 86), the intervention group attended a CR program comprising exercise and education based on Social Learning principles, such as goal setting, skills training, feedback, reinforcement, modelling, self-monitoring and the provision of social support (Oldenburg, Martin, Greenwood, Bernstein, & Allan, 1995). After twelve



months, there was a significant decrease in fat intake in the intervention and control group (which received usual care), with no difference between the groups. High density lipoprotein levels increased in both group but both groups showed an average increase of 0.75kg in body weight and a significant increase in percentage body fat. The findings show that the CR program was not any more effective than usual care for the outcomes measured. The issues affecting the results are the small sample size, the fact that thirty percent of eligible patients declined to take part, which may mean that they differed in some systematic way from the study participants, and the fact that most studies of CR programs have included MI patients and it is possible that CABG patients may differ from MI patients in their response to this type of rehabilitation.

In another American evaluation of an education program, post-MI men and women (n = 258) were randomly assigned to usual care, an exercise program with information-based non-individualised group education and an exercise-only program (Sivarajan et al., 1983). Subjects in all groups reduced saturated fat and cholesterol foods but there were no significant differences between groups. Coffee and sodium intake were lower in the education and exercise group.

Another study of an inpatient CR program also showed no difference in dietary compliance between those receiving structured education and those who did not (Scalzi et al., 1980) but a study of additional nutrition advice given by a dietitian, compared with usual advice given by a physician or nurse, found that those receiving NE from a dietitian had a greater increase in knowledge and a lower fat and cholesterol intake and lower BMI. Both groups, however, were able to reduce serum lipid levels (Rhodes, Bookstein, Aaronson, Mercer, & Orringer, 1996).

## **Nutrition Education Strategies for Patients with Heart Disease**

Early studies of CR programs showed that NE in many programs is without a theoretical foundation and is not based on behaviour change principles (Smith & Lopez, 1991) and understanding of the motives and processes involved in food selection is often lacking (Lewis, Sims, & Shannon, 1989).

The only meta-analysis undertaken in this area was by Contento in 1995, who analysed twenty-eight controlled trials of cardiac patient education (Contento et al., 1995). Outcomes, type of education and adherence to five key principles of education were assessed. The five principles were reinforcement of positive behaviour, providing feedback on progress, tailoring the program to the individual, facilitating behaviour change and ensuring relevance of the content and methods to the patients' concerns. Few of the programs analysed were based on standard educational models of behaviour change and none incorporated all five principles. Programs that adhered to at least some of the principles and those that emphasised behavioural interventions had more positive effects on parameters such as blood pressure, mortality, exercise and diet. Educational strategies appeared to have more influence on outcomes than number of hours of education or type of communication channel.

This review by Contento concluded that the most effective NE programs are those based on theoretical models that include individualised approaches, motivation by emphasising personal consequences and the use of behaviour change strategies. Recommendations of the review are that further research into NE in clinical behavioural programs with high-risk populations is undertaken and that effective educational strategies that contribute to a successful outcome are published so that these strategies can be incorporated into other programs.

## **Perceived Barriers to Dietary Change**

Most studies in this area are not recent and perceived barriers are likely to have changed in the light of improved availability of low-fat or reduced-fat foods and their increasing social acceptance.

An American investigation of the knowledge, attitudes and healthy dietary practices of 76 CR program participants found that the majority of participants in this study had positive attitudes about the value of diets low in fat and cholesterol, had family support to change their diets and were able to exercise self control over their eating (Johnson & Vickery, 1990). However, most (68%) believed that it was necessary to give up many of the foods they loved to follow the diet. In spite of this, 91% claimed to be following the diet, with 17% of these claiming to follow the diet 'all the time', 77% 'most of the time' and only 6% 'sometimes'.

In a survey of 1,700 people in the United Kingdom in 1992, 61% thought that eating less fat was very important and 32% thought it fairly important (Buttriss, 1997). Most had heard of cholesterol, saturated fat and PUFA but fewer had heard of MUFA and very few were confident in describing what these were. More than 85% of subjects scored 50% or less in identifying foods containing saturated fat and PUFA. In this survey, only 6% of health professionals said that they were confident about explaining the link between diet and CHD. Main motivating factors for dietary change were general health improvement, weight loss or personal health problems. The barriers identified were lack of knowledge and incorrect knowledge, cost, time, conservatism and the perception that health food is boring. Older people and men were more likely to believe that diet was not important as long as they were reasonably active.

In another study of 300 healthy middle-aged men, barriers to the adoption

of low-fat diets were taste, inconvenience and lack of support from family, friends and physicians (Terry et al., 1991). An Australian population survey in 1990 found that 88% had experienced difficulty in changing their diet (Crawford & Baghurst, 1990). Lack of willpower was a problem for 51% of women and 29% of men, lack of good advice or information caused difficulty for 14% of men and 7% of women and lack of family support was a problem for 10% of women and 4% of men. Less common barriers (6% or less of subjects) were lack of availability or lack of time to buy or prepare healthy foods and the cost, taste or variety of the new diet.

## Conclusion

This review of relevant literature has revealed a consensus of opinion about dietary factors associated with CHD and the importance of dietary behaviour change in secondary prevention, especially modification of the type and amount of fat in the diet. Saturated fat is still regarded as a key dietary contributor to CHD and MUFA and PUFA, especially omega-3 fatty acids and fatty fish, are recommended as substitutes for saturated fat. Restricting dietary cholesterol is no longer emphasised and the importance of fruit and vegetables has been established.

Large numbers of Australians have one or more risk factors for CHD and overweight and obesity is a major concern, especially visceral obesity, which is particularly associated with CHD.

CR programs have been shown to have positive effects on health outcomes and exposure to NE in CR programs has been associated with dietary improvement in the short-term. Compliance in some patients with CHD has been shown to decline over time, especially in the absence of monitoring. However, as most of these studies rely on self-reporting, the accuracy of claims made about compliance cannot be established.

There is conflicting evidence about the effectiveness of behavioural versus didactic teaching strategies for NE. Knowledge and attitudes are both associated with dietary behaviour and, in motivated patients with CHD, knowledge-based teaching may be effective. There are few studies in published literature specifically evaluating the effectiveness of different types of NE in CR programs. However, some studies reviewed show that didactic NE that focuses on disseminating knowledge appears to be less successful than behavioural education that focuses on attitudes and enhancing motivation to change eating behaviour. NE theory and

recommendations for NE in CR programs endorse the use of behavioural techniques but most programs do not appear to be complying with this recommendation.

There is considerable debate about different models of behaviour change and there is evidence that the Transtheoretical (Stage of Change) model, the Health Belief model, the Theory of Reasoned Action model and the Cognitive Social Learning (Self-efficacy) model are associated with dietary behaviour. However, the most appropriate model for CR participants has not been determined. The importance of knowledge and attitude on dietary change has not been established in CR patients but the use of educational strategies designed to impact on these parameters is well-accepted in adult education. Nutrition knowledge and long-term compliance with cardiac diets is poor. Providing CR program participants with knowledge about healthy eating is essential but may not have the desired effect of long-term dietary compliance unless this is combined with appropriate behaviour change strategies.

Adult education is believed to be more effective if delivered in several sequential sessions of structured group education designed to encourage the building of skills, with the same facilitator at each session, using oral and visual teaching methods and written handout material. Health education should be based on a conceptual framework and recommended strategies include using an individualised patient-centred approach, providing personalised information on the health benefits of dietary change, encouraging family support and incorporating feedback on progress, positive reinforcement, goal setting and problem-solving. The emphasis should be on active participation, identifying and resolving barriers to change and increasing positive attitudes and self-efficacy.

This review has revealed little information about the aims, objectives, structure, content, educational methods used and effectiveness of NE in Australian or Victorian CR programs. As NE is regarded as an integral component of CR programs, it is important to attempt to assess the manner in which it is currently delivered and its effectiveness in terms of dietary improvement, with the aim of informing current theory and practice to facilitate optimal outcomes.

## CHAPTER 2

### RESEARCH AIMS, OBJECTIVES AND HYPOTHESES

The themes that have emerged from the literature review have led to the formulation of the following hypotheses:

1. NE is included in all Victorian outpatient CR programs and accords with HF recommendations;
2. The impact of NE and participant satisfaction with NE is greater in participants exposed to more NE;
3. Dietary compliance with low-fat diets in CR patients is reduced one year after leaving the CR program.

As NE in Victorian outpatient CR programs has not previously been investigated in a systematic way, much of the research described in this thesis is exploratory in nature and the testing of these hypotheses was incorporated into an evaluation of NE. This evaluation is in five parts and comprises process (formative) evaluations of NE in outpatient CR programs, the characteristics of participants and participants' satisfaction with NE and two summative evaluations, an impact and an outcome evaluation of NE.



## **Evaluation Research Theory**

The research methodology described in this thesis is based on the theory and practice of evaluating health promotion programs, as recommended by Hawe, Degeling and Hall (Hawe, Degeling, & Hall, 1990). CR programs can be regarded as health promotion activities, fitting the general definition of health promotion as outlined by Green and Anderson (Green & Anderson, 1986, p. 516):

"Any combination of health education and related organisational, economic and environmental support for behaviour of individuals, groups or communities conducive to health."

Evaluation is a systematic method of collecting information in order to make a judgement and includes observation and measurement and a comparison of the results with a standard that indicates good performance (Hawe et al., 1990).

### **Limitations of Evaluation**

Health program evaluation may be limited in many ways. The usefulness of the evaluation may be limited by failure to address the needs of stakeholders, lack of credibility on the part of the evaluator, failure to obtain information of sufficient scope and relevance, biased value judgements, reporting that is unclear, untimely or disseminated improperly and use of poor evaluation design that fails to encourage follow-through by stakeholders (Centers for Disease Control and Prevention, 1999). The accuracy of the evaluation may be limited by lack of pertinent standards with which to compare programs, inadequate program documentation regarding aims, objectives, content and delivery methods, differing delivery, contexts and settings in which the program is being carried out, inadequate information sources, use of non-validated or unreliable measures, inaccurate data collection, recording and analysis, unjustified conclusions and

biased reporting (Centers for Disease Control and Prevention, 1999). These potential limitations were taken into account as much as possible in the design, implementation and reporting of this evaluation.

### **Types of Evaluation**

Several types of evaluations were used in this investigation. According to Hawe, Degeling and Hall (Hawe et al., 1990), process (formative) evaluation is an investigation of what is actually occurring in a program or intervention and is necessary before any evaluation of program effects. If the program is not being implemented according to plan, it would not be expected to deliver the desired outcomes. Process evaluation of health programs may include investigations into whether the program is reaching the target group, whether all the activities of the program are being implemented, whether the materials and components are of good quality and whether participants are satisfied with the program. The process evaluations discussed in this thesis were confined to the NE activities in CR programs and participants' satisfaction with NE. The performance standards used were the HF recommendations for CR programs (National Cardiac Rehabilitation Advisory Committee of the Heart Foundation of Australia, 1998) and for NE (National Heart Foundation, 1993), as these were the resources most commonly used in the design of Victorian CR programs.

Summative evaluations of health programs are used to measure program impact and outcomes. Impact evaluation is used to measure the immediate effect of the program and outcome evaluation measures the long-term effects. The impact evaluation of NE discussed in this thesis aims to establish if participants' dietary fat knowledge, attitudes and habits change after exposure to NE and to measure any changes. Ideally, an outcome evaluation of NE would measure long-

term physiological changes related to dietary improvements, such as reduced serum cholesterol or reduction in atheroma progression but these measurements were beyond the scope of this research. Therefore, this outcome evaluation of NE aims to measure participants' dietary fat knowledge, attitudes and habits at a longer time interval after completing the CR program and to determine if changes have occurred.

As the research in this thesis is of an exploratory nature, no standards exist regarding the amount of change in these parameters expected after exposure to NE in Victorian CR programs. The literature review has not revealed any well-accepted standards applicable to Victorian CR programs. Therefore, the results of the summative evaluations will not be compared to a standard of expected improvement but will attempt to establish if NE results in any significant improvement in dietary fat knowledge, attitudes and habits and, if so, whether the improvements are greater in those exposed to more NE and whether improvements are maintained after leaving the CR program.

**Part 1: A Process Evaluation of Outpatient Cardiac Rehabilitation  
Programs in Victoria and the Nutrition Education Component.**

**Aim**

The aim of Part 1 was to evaluate the NE component of CR programs by identifying the structure, content and delivery methods used, aims and objectives, barriers and additional resources needed. This information was used to compare NE to the HF recommendations (National Cardiac Rehabilitation Advisory Committee of the Heart Foundation of Australia, 1998; National Heart Foundation, 1993).

**Objectives**

To answer the following questions:

- What is the general structure of the CR programs;
- How much time is allotted to NE;
- What are the aims and objectives, content, delivery, resources and evaluation methods used for NE;
- Are there barriers affecting NE;
- Do programs accord with HF recommendations?

**Main Hypothesis**

NE is included in all Victorian outpatient CR programs and accords with HF recommendations.

**Part 2: A Process Evaluation of Outpatient Cardiac Rehabilitation  
Participants' Characteristics and Nutrition Knowledge, Attitudes and Habits  
prior to Nutrition Education.**

**Aim**

The aim of Part 2 was to evaluate the characteristics of CR program participants, including information on their sociodemographic profile, BMI and type of heart disorder, and to assess their prior nutrition exposure and their nutrition knowledge, attitudes and habits before attending NE.

**Objectives**

To answer the following questions:

- What are the characteristics of CR participants;
- What is their exposure to nutrition information or advice prior to NE;
- What is their level of dietary knowledge and their dietary attitudes and habits before NE;
- Do differences exist in these parameters between CR and non-CR subjects;
- What are the factors associated with dietary knowledge, attitudes and habits before NE?

## **Part 3: An Impact Evaluation of Nutrition Education in Outpatient Cardiac Rehabilitation Programs.**

### **Aim**

The aim of Part 3 was to determine the impact of NE on participants' nutrition knowledge, attitudes and habits during the CR program and to identify factors associated with changes in dietary habits.

### **Objectives**

To answer the following questions:

- Is there a difference in participants' nutrition knowledge, attitudes and dietary habits after NE;
- Is exposure to more NE associated with greater improvements in dietary knowledge, attitudes and habits;
- If dietary improvements are detected, what are the associated factors;
- What is the relationship between nutrition knowledge, attitudes and dietary habits after NE?

### **Main Hypothesis**

Because effective adult education for behaviour change requires considerable time, CR participants exposed to more NE have greater improvements in dietary knowledge, attitude and behaviour in the short-term than those exposed to lesser amounts of NE or no NE.

## **Part 4: A Process Evaluation of Outpatient Cardiac Rehabilitation**

### **Participants' Satisfaction with Nutrition Education.**

#### **Aim**

The aim of Part 4 was to evaluate CR participants' satisfaction with the NE sessions they attended.

#### **Objectives**

To answer the following questions:

- What is the level of participant satisfaction with the content and delivery of the NE session(s);
- Do participants request more information on certain topics;
- What do participants find most helpful;
- What are participants' suggestions for improvements?

#### **Main Hypothesis**

Participants' satisfaction with NE is greater in those exposed to more NE.

## **Part 5: An Outcome Evaluation of Nutrition Education in Outpatient Cardiac Rehabilitation Programs.**

### **Aim**

The aim of Part 5 was to evaluate changes in CR participants' BMI and nutrition knowledge, attitude and habits one year after leaving the CR program.

### **Objectives**

To answer the following questions:

- Are there changes in the nutrition knowledge, attitudes and habits of CR participants one year after leaving the program;
- Are there changes in the BMI of participants one year post-CR;
- What are the factors associated with dietary habits and BMI one year post-CR;
- Does the macronutrient composition of participants' diets one year post-CR meet the recommendations for secondary prevention;
- Are participants' diets one year post-CR healthier than average Australian diets?

### **Main Hypothesis**

As the literature review revealed that compliance with low-fat diet deteriorates over time, the hypothesis is that compliance with low-fat diets in CR patients is reduced one year after leaving the CR program.



## CHAPTER 3

### METHODS

#### **Part 1 Methods: A Process Evaluation of Outpatient Cardiac Rehabilitation Programs in Victoria and the Nutrition Education Component.**

Information was gathered by discussions with HF staff, CR coordinators and nutrition educators, observation of NE sessions and a descriptive, cross-sectional postal survey sent to coordinators and NE educators in all outpatient CR programs in Victoria in 1997.

A list of outpatient CR programs in Victoria (N = 74), with contact names, was obtained from the HF. Fifty-six programs were offered by hospitals and eighteen by community health centres. Forty-three programs were in country Victoria (33 of which were offered by hospitals) and the remainder were Melbourne-based.

#### **Observation Method**

Visits were arranged to CR programs at three metropolitan hospitals, one rural hospital and one metropolitan and one rural community health centre to observe NE sessions. A mix of metropolitan and rural programs and larger and smaller programs were included to increase the representativeness of the sample but specific programs were chosen for convenience of access. An observation record was designed (see Appendix 1) and used to ensure an accurate and complete record of activities of interest. Information was gathered about the topics covered, the educational techniques and resources used and the quality of the presentation and general impressions gained about the participants and the session.

### Observation Limitations

Direct observation can be used to complement survey research and gain insight into 'real world' activities but a major drawback is that the presence of an observer is likely to affect the situation under observation (Robson, 1993). The nutrition educator may make changes to the NE session in order to impress the observer, especially if it is known that the observer is undertaking an evaluation of NE. The presence of an observer may also change the behaviour of the CR participants. Therefore, the observer is not exposed to a 'typical' session and may collect inaccurate data. The observer may also have personal biases that affect the observation data. Also, in this case, single observations were used, which are not likely to give a true picture of the whole NE process, but more extensive observation was not possible because of time constraints. Therefore, the observation data have limited use in this instance but were considered a useful starting point in gaining some basic understanding of how NE is delivered in Victorian CR programs.

### Survey Method

A postal survey to be completed by the CR coordinator and the nutrition educator in each Victorian program was considered the most cost-effective and least time-consuming method of gathering general, representative information on activities in Victorian CR programs to serve as a basis for further research.

### Survey Limitations

The accuracy of survey data depends on whether appropriate questions are included, whether ambiguities or potential misunderstandings are identified and excluded and whether questions are phrased in such a way as to avoid prompting a 'correct' response. Survey responses may be affected by the individual

characteristics of the respondents, such as their knowledge, experience, motivation and personality (Robson, 1993). There is likely to be a social desirability bias (Robson, 1993) as CR coordinators and nutrition educators would be expected to present their activities in the best possible light. Postal surveys typically have a low response rate and may not be taken seriously (Robson, 1993). These factors were taken into account as much as possible in the design of the survey instrument and delivery.

#### Survey Instrument Development.

After gathering background information from the observation records and discussions with nutrition educators, a draft questionnaire was drawn up in consultation with the Nutrition Manager and Cardiac Rehabilitation Manager of the HF and Deakin University academic staff. The draft questionnaire was piloted by two CR program nutrition educators to check for questions that were ambiguous or likely to be misunderstood and it was then further revised.

The final questionnaire consisted of 18 questions, covering background details about the CR coordinator and NE educator and questions on the general structure of the CR program and specific information about NE, including the content, aims, objectives, education methods, resources used, facilities for non-English speaking participants, evaluation, participants desire for more NE, barriers to NE, additional resources needed and general comments (see Appendix 2). Questions about the structure of the program were closed “fill in the box” style. Questions on NE aims, objectives, topics, facilities for non-English-speaking participants and general comments were open-ended. To avoid prompting the responses, specific questions regarding the use of behaviour change strategies were not included. Questions on educational techniques, resources, evaluation and

suggestions for HF assistance were in closed “tick the box” format, combined with an open-ended category for additional comments.

### Survey Procedure

Questionnaires were posted on 24 February, 1997 to all Victorian outpatient CR programs, with a postage-paid envelope for return and a covering letter offering a HF cookbook as an incentive to respond. Forty-nine completed questionnaires were returned by the requested date, a 68% response. A follow-up letter was sent on 19 March, 1997 to those who had not yet returned questionnaires and subsequent follow-up phone calls resulted in all questionnaires being returned, a response rate of 100%.

### Data Analysis

Results of the questionnaire were analysed by descriptive statistics using Excel 97 computer software (Microsoft Corporation, 1985-96). Responses to open-ended questions were sorted manually into appropriate categories before being analysed. Results were compared to the HF recommendations.

**Part 2 Methods: A Process Evaluation of Outpatient Cardiac Rehabilitation  
Participants' Characteristics and Nutrition Knowledge, Attitudes and Habits  
prior to Nutrition Education.**

Participants in three hospital (n = 222) and two health centre (n = 95) outpatient CR programs in Victoria were involved in this part of the study (n = 317). During 1997-99, participants were surveyed by questionnaire while attending the CR program but prior to NE exposure to determine sociodemographic and background information and their nutrition knowledge, attitude and habits. Pulmonary Rehabilitation (PR) program participants (n = 41) from one of the hospitals included in the CR study group were surveyed on entry to the PR program and acted as a comparison group.

**Survey Method**

As CR programs run on a continuous cycle, patients entered the program at any session in an unpredictable fashion. Because of time constraints in accessing the numbers required, it was not possible to restrict the survey to those attending their first session and patients were therefore screened before they were invited to join the study and those that had previously attended an NE session were excluded. This meant that patients were surveyed during their first or up to their sixth session, depending on the scheduling of the NE session in the particular CR program. Participants were interviewed at the program, given a plain language statement (see Appendix 3) and invited to join the study. Those who agreed signed a consent form (see Appendix 4) and completed the questionnaire during the course of the session. Questionnaires were given directly to the researcher on completion.

In the PR group, the PR coordinator delivered and collected the

questionnaire during the pre-program assessment or at the first PR session. The PR questionnaire included the same sociodemographic, knowledge, attitude and intake questions, with additional questions on health disorders and use of therapeutic diets (see Appendix 5). All questionnaires were available in English only. Non-English-speaking patients, if accompanied to the program, were assisted by English-speaking family members and, when time permitted, CR staff or the researcher assisted participants who had reading or writing difficulties.

#### Survey Limitations

As discussed previously in this chapter, pp. 98-99, there are several limitations to the use of surveys in general. Self-administered survey responses may be affected by the individual characteristics of the respondents, such as their knowledge, experience, motivation and personality and there is likely to be a social desirability bias (Robson, 1993). CR participants may give responses in accordance with the perceived program goals, rather than their true responses. A lack of interest in the questionnaire would also affect the responses but this was less likely as participation was voluntary.

Questionnaires were not given prior to entry to the program and, although screened for NE attendance, some participants had attended one or more CR sessions and may have been exposed to informal dietary information from staff or discussions with other participants which may have influenced the results. For dietary attitude and habits questionnaires in particular, it is difficult to phrase questions to avoid prompting a 'correct' response, as nutrition messages have been widely promoted in Australian communities and CR participants would be expected to have at least a general knowledge of healthy eating practices.

All questionnaires were available in English only and patients required

adequate vision, comprehension and English-reading skills in order to participate. In some cases, non-English-speaking patients and those with reading or writing difficulties were given assistance and this assistance may have influenced participants' answers.

In most programs, there was no specific time allowed during the program to complete the questionnaires and respondents completed them before the session, if they arrived early enough, or at intervals during the session when there was an opportunity. Completing questionnaires during the session may have caused respondents to lose concentration or rush their responses.

These limitations were taken into account as much as possible in the design and delivery of the questionnaires.

#### Dietary Survey Limitations

A seven-day weighed-food record is a widely-accepted standard for the measure of dietary intake but problems of under-reporting exist in any method of assessing food intake relying on self-reporting (Paisley, Lloyd, Brown, & Mela, 1996). CR program participants are often elderly, frail and easily fatigued, with vision, comprehension and concentration difficulties as a result of their circulatory disorders. A short, easy-to-use, self-administered questionnaire was considered more acceptable than a more complex food record instrument and could be completed during the CR program session, thus avoiding the problems of questionnaires being taken away and not being returned and of participants finding out the correct answers to the dietary fat knowledge component.

A problem with this methodology is that dietary assessment instruments based on self-reporting have been found to be susceptible to bias (Friedenrich, Slimani, & Riboli, 1992). Respondents may report eating behaviours that match

the goals of the intervention program rather than their actual eating behaviours (Hebert, Clemow, Pbert, Ockene, & Ockene, 1995). This type of bias has been termed 'response set bias'. A study that investigated dietary assessment response set bias related to fat intake (Kristal, Andrilla, Koepsell, Diehr, & Cheadle, 1998), found significant bias for a food frequency questionnaire based on the amounts of twenty-two foods or food groups consumed over the past six months and for a food behaviour checklist based on the amounts of twenty-three foods eaten or not eaten over the previous day. No bias was found for a fat-related dietary behaviour questionnaire consisting of nineteen questions about food preparation methods and the frequency of selecting fat-related foods during the past three months. This report concluded that people can more accurately report the frequency of eating foods rather than the specific amounts of foods eaten. Therefore, it was decided to use a validated food frequency questionnaire about food selection and preparation similar to those having a low response set bias.

#### Survey Instrument Development

From the results of the Part 1 survey, it was clear that the common and most important topic in all outpatient CR programs was dietary fat and the central role of dietary fat as a contributing factor to CHD is supported by high quality reviews (Hooper et al., 2001; Hooper et al., 2003). It was therefore decided to assess knowledge, attitude and dietary behaviour related to fat as an indicator of the effectiveness of NE.

A review of the literature uncovered several questionnaires related to fat intake (Block, Clifford, Naughton, Henderson, & McAdams, 1989; Connor et al., 1992; Dobson et al., 1993; Johnson & Vickery, 1990; Kempainen et al., 1993; Kristal et al., 1990; Levy, Fein, & Stephenson, 1993; Shepherd & Towler, 1992;



Stafleu, de Graaf, & van Staveren, 1994; Steptoe et al., 1996). On reviewing these questionnaires, however, it was found that those used in overseas studies were not useful as they were too general and referred to foods not commonly used in Australian diets.

A review of Australian dietary behaviour questionnaires found that the most useful was a questionnaire developed by Professor Annette Dobson and associates from the Centre for Clinical Epidemiology and Biostatistics, University of Newcastle, New South Wales (Dobson et al., 1993). This was called the "Short Fat Questionnaire" and consisted of seventeen questions related to intake of fat-containing foods, including the frequency of eating fat-containing foods, methods of cooking meat, amount of butter or margarine used on bread and type of milk used. Possible total scores were 0 to 62, with a low score indicating a low fat intake.

Possible responses to questions of how often or how many times a week foods were eaten were "never", "less than once a week", "once or twice a week", "three to five times a week" or "six or more times a week". Possible responses to a question on how meat was usually cooked were "only eat meat occasionally or never", "grilled or roasted without added fat or oil", "grilled or roasted with added fat or oil", "stewed or goulash" or "fried". Possible responses to a question about the amount of margarine or butter used were "don't use butter or margarine", "thinly" or "thickly" and, for a question about type of milk, possible answers were "skim or none", "reduced fat", "full cream and reduced fat", "full cream" and "condensed". For a question about how much chicken skin was eaten, possible responses were "none of the skin", "some of the skin" or "most or all of the skin". For a question about how much meat fat was eaten, possible responses were "none

of the fat”, “some of the fat” or “most or all of the fat”.

This questionnaire appears to be similar to the style of questionnaires reported by Kristal (Kristal et al., 1998) as having no response set bias. Dobson (Dobson et al., 1993) stated that it is short, self-administered and easy to use. This was tested on an Australian community and was reported to have satisfactory criterion validity when compared with a well-established food frequency questionnaire and to have high reproducibility and discriminant validity. High correlations were found between the total fat score and the food frequency questionnaire for total fat and saturated fat as percentages of energy and the study reported moderate to strong associations with scales of attitude and a weak association with dietary fat knowledge.

The Short Fat Questionnaire has been piloted on Victorian CR program participants and was found to correlate well with a food frequency questionnaire used in Australian community dietary fat studies (Read, 1994). It has been incorporated into the HF's Victorian Cardiac Rehabilitation Questionnaire (VCRQ), which also contains questions on attitude towards healthy eating developed and validated for this population (Robinson & McBurney, 1993).

The VCRQ attitude scale consisted of ten healthy eating attitude statements and participants were asked whether they “strongly disagreed”, “disagreed”, “agreed”, “strongly agreed” or were “undecided” about each statement. “Agree” and “strongly agree” responses were regarded as positive, “disagree” and “strongly disagree” responses were regarded as negative, with reverse coding for negatively-phrased questions. Responses for each of the ten questions were scored from one to five. Possible total scores were 10 to 50, with a high score indicating a positive attitude.

It was decided to use the validated questionnaires relating to attitude to healthy eating and dietary fat intake from the VCRQ and to investigate suitable dietary fat knowledge questionnaires for inclusion in the evaluation instrument.

#### Development and Validation of a Dietary Fat Knowledge Questionnaire

Nutrition knowledge questionnaires in the published literature were found to be unsuitable as they covered a wide range of nutrition topics that are not universally addressed in Victorian outpatient CR programs. The knowledge scale used in the Dobson study (Dobson et al., 1993) consisted of twenty items, only nine of which related to dietary factors linked to heart disease, and this had a weak correlation with the fat intake questionnaire scores. As it had a limited number of relevant items and had not been developed for, or validated on, a CR population it was regarded as unsuitable and it was decided that a knowledge questionnaire covering dietary fat topics common to all NE in Victorian outpatient CR programs was needed.

Information from the part 1 survey on topics covered in NE was used as the basis for developing items for inclusion. Content and face validity was assessed during the generation of the questions by consultation with Deakin University nutrition educators, three dietitians and three CR program nutrition educators. Initially, a short 15-item instrument was developed using a simple correct/incorrect, "tick or cross the box" response format to suit the needs of CR program participants. Items included seven correct statements and eight incorrect statements randomly ordered to avoid automatic responses. This was then piloted on ten participants at two Victorian outpatient CR programs. Results were analysed for internal consistency by SPSS version 8.0 (SPSS, 1998) reliability analysis, using Cronbach's alpha instead of the Kuder-Richardson 20 coefficient.

Advice from the University biostatistician was that, when responses are coded dichotomously as '0' or '1', Cronbach's alpha is identical to the Kuder-Richardson 20 coefficient. The Cronbach's alpha score was 0.3, showing poor internal consistency when compared to the recommended value ( $>0.8$ ) (Munro, 2001), and it was therefore decided that the instrument was not suitable as a measure of dietary fat knowledge and would need considerable revision.

A review of the instrument, after further consultation with nutrition educators, showed that there were insufficient statements relating to knowledge of the fat content of food products and it was therefore expanded to include these and to increase the total number of items to allow for deletion of those that may show poor item-total correlation. Thirty-two items were finally selected and also formatted for correct/incorrect "tick the box" responses.

The revised questionnaire was piloted on eighteen outpatient CR program participants. Internal consistency was analysed by SPSS reliability analysis and Cronbach's coefficient alpha was 0.78. There were three items with zero item-total correlations and others with correlations less than 0.2, which are regarded as too low (Shepherd, 1987). The questionnaire also contained a large number of items which would make the combined knowledge, attitude and intake questionnaire too long and tiring for participants to complete. Accordingly, statements with item-total correlations of zero or less than 0.2 were deleted to leave twenty-one questions with high internal consistency (Cronbach's alpha 0.83) and with all items having item-total correlations greater than 0.22.

Item facility tests showed that no item was too difficult (all items had more than 20% correct responses), however, five were relatively easy (83% correct responses). Although items with greater than 80% correct responses are generally

not desirable (Streiner & Norman, 1992), they were retained because the percent correct was only 3% over the cut-off value and they were important in assessing knowledge of the fat contained in commonly-eaten food items, namely meat, processed meat, fish, roast or fried potatoes and milk.

The final knowledge questionnaire consisted of ten correct statements and eleven incorrect statements, with satisfactory face and content validity, randomly ordered to negate the effect of automatic responses. Participants were asked to place a tick in the box opposite the statement if they considered it correct or to place a cross in the box if incorrect. If they were unsure, they were asked to leave the box blank. Correct answers were given a score of '1'. Incorrect or blank responses were given a score of '0', as either of these responses were regarded as indicating lack of knowledge. This scoring method has been used in two previous studies (Trent, 1992; Turrell, 1997). Possible total scores were 0 to 21, with a high score indicating a high level of knowledge.

Test re-test reliability was assessed by administering the questionnaire on two occasions two weeks apart to the same group and the Pearson correlation coefficient was 0.72,  $p < .001$ , which is regarded as satisfactory (Nunnally, 1978).

Construct validity was tested by administering the questionnaire to a group of nutrition students ( $n = 21$ ), who would be expected to have better knowledge, and comparing responses with the CR pilot responses ( $n = 18$ ). An independent-samples t-test found that the nutrition students' scores were significantly higher (mean difference (MD) = 4.67,  $t = 4.06$ ,  $p < .01$ , 95% confidence interval (CI) 2.28 to 7.06), showing that the questionnaire had construct validity.

### Pre-test questionnaire format

The three validated questionnaires discussed above (dietary fat knowledge, healthy eating attitude and fat intake) were incorporated into one survey instrument. Sociodemographic details on age, gender, height, weight, living arrangements, preferred language, education, employment, type of heart disorder, previous attendance at a CR program and previous nutritional advice or information received were added to the pre-test instrument.

The questionnaire was clearly laid out with adequate spacing and a font size of 12 for legibility. Initially, this was in a four-page double-sided lay-out to give a shorter appearance but, after piloting this format, it was found that some elderly participants failed to notice the items on the reverse and it was changed to single-sided. The final questionnaire was an eight-page single-sided instrument of four main sections: sociodemographic information, dietary fat knowledge, healthy eating attitude and fat intake (see Appendix 6).

### Data Analysis

SPSS for Windows Version 8.0 computer software was used for data analysis (SPSS, 1998). The level of significance for all statistical tests was less than 5% ( $p < 0.05$ ). Descriptive statistics were used to describe the composition of the CR and PR groups and CR participants' responses to individual knowledge, attitude and intake questions. Prior to calculating descriptive statistics, ratio data was tested for normality. Fisher's skewness (FS) and Fisher's kurtosis (FK) statistics were calculated, divided by their standard errors (SE) and compared to the accepted cut-off values for normality ( $> -1.96$  to  $< +1.96$ ) (Munro, 2001). Internal consistency was confirmed by reliability analysis using Cronbach's alpha.

Differences in fat intake between the CR group and the community were

assessed by one-sample t-tests and 95% confidence intervals (CI). Differences in sociodemographic variables and questionnaire scores between the CR group and the PR group were analysed by Mann-Whitney U, chi-square, Phi and Cramer's V tests to assess the strength of the differences and independent samples t-tests, CI and omega squared. Cohen (Cohen, 1988) defines chi-square effect sizes as 0.1 = small, 0.3 = moderate and 0.5 = large. Levene tests were used with t-tests to check that variances were not significantly different.

Pearson chi-square analysis, with Phi and Cramer's V tests, and independent samples t-tests, with CI and omega squared, were used to assess sociodemographic differences and questionnaire score differences by sociodemographic factors.

Relationships between questionnaire scores and sociodemographic variables were assessed by Pearson product moment correlations and partial correlations to control for potentially confounding variables. Cohen (Cohen, 1988) defines a correlation coefficient of 0.10 to 0.29 as small, 0.30 to 0.49 as moderate and 0.50 to 1.00 as large.

Simultaneous multiple regression analysis was used for linearly-related variables to assess factors associated with intake and attitude, with adjusted R square ( $R^2$ ) calculations for percentage of variance explained. Cohen (Cohen, 1988) defines an  $R^2$  of 0.02 as small, 0.13 as moderate and 0.30 as large. Prior to regression, data was inspected to ensure that there were no extreme outliers, multicollinearity or singularity and that normality, linearity and homoscedasticity assumptions were met.

### **Part 3 Methods: An Impact Evaluation of Nutrition Education in Outpatient Cardiac Rehabilitation Programs.**

To determine the impact of NE, a quasi-experimental comparison group program trial was designed, using some of the participants in the initial survey and surveying them again after NE exposure. Sample size was calculated using effect sizes for nutrition knowledge and behaviour from meta-analyses of published NE studies (Johnson & Johnson, 1985), which, although very out-of-date, were the only effect sizes obtainable, and Cohen's formula for testing the significance of independent means (Welkowitz, Ewen, & Cohen, 1982). Mean effect size for nutrition knowledge was reported as 0.71 and 0.40 for eating behaviour. As the main outcome of interest was eating behaviour, the behaviour effect size of 0.40 was used, giving a power of 0.71 and a minimum sample size of 79 per group.

#### **Quasi-Experimental Comparison Group Program Trial Method**

Data were collected by self-administered surveys during 1997-2000. All data was collected from Melbourne metropolitan CR programs. One health centre and one hospital program became one of the experimental groups (n = 80), with participants having a total of approximately one hour of formal NE (one 50 or 60 minute session per program). One hospital program became a second experimental group (n = 80), with participants having a total of 4½ hours of formal NE (one 45 minute session each week for 6 weeks) and additional access to the dietitian. One health centre and one hospital program became a comparison group (n = 80), with no exposure to formal NE.

In the one-hour experimental group, contact with the dietitian was confined to one NE session that was a combination of lecture and group discussion, supported by the use of overhead transparencies, whiteboard, food



products, videos and handout material. The 4½-hour group attended an NE session once weekly for six weeks which was similar in format, however, the dietitian also attended one of the twice-weekly exercise sessions to give individual advice on request.

#### Quasi-Experimental Comparison Group Program Trial Limitations

A quasi-experimental design was necessary because CR program attendance is regarded as essential treatment in secondary prevention and randomisation of patients to either CR or no CR was not possible or ethical. Patients were only accessible after already joining a CR program and it was not possible to randomly assign patients to a particular program. Randomisation of groups was also not practicable and programs were therefore selected for inclusion on the basis of practicalities such as accessibility, ability to obtain ethics committee approval, willingness of CR program staff to co-operate and program schedules that allowed for delivery of pre- and post-questionnaires at appropriate times.

A quasi-experimental design is vulnerable to threats to internal and external validity. Internal validity is the extent to which observed changes are due to the intervention. Factors affecting internal validity in this type of trial may include the following (Windsor, Baranowski, Clark, & Cutter, 1994):

- History - unplanned events within or outside the program occurring during the evaluation period that cause change in dietary fat knowledge, attitude or intake;
- Maturation - the changes occurring in staff, participants or procedures over a period of time;

- Testing - the pre-test questionnaires impacting on outcomes and leading to biased responses;
- Selection - the use of a non-equivalent group as a comparison group;
- Participant attrition - those dropping out of the program having different characteristics to those continuing to attend.

History factors would be expected to affect both experimental and comparison groups similarly, however the effect of local factors on specific groups cannot be ruled out in this study design. The maximum time frame between pre and post measurements was six weeks, with most being two weeks, therefore maturation is unlikely to be a significant factor. Testing effects are likely but would affect both experimental and comparison groups in a similar fashion. Selection bias is the main threat to internal validity in this trial and therefore every effort was made to ascertain that the characteristics of all groups at baseline were closely matched. Participant attrition is common in Victorian CR programs (Bunker et al., 1999) and those dropping out are likely to differ in important ways from those completing the evaluation, however a follow-up of those who dropped out was beyond the scope of this trial.

The major threat to external validity (the extent to which the trial results can be generalised to the CR population) is selection bias and participants cannot be regarded as representative of those in all other CR programs because randomisation was not used in the selection process. As this trial is not a true experimental design and is subject to threats to validity as outlined above, the results should be interpreted cautiously and may not be representative of other CR programs.

## Survey Procedure

The questionnaire delivery method has been described in Part 2. The one-hour experimental group was surveyed one week prior to the NE session and one week afterwards. The 4½-hour experimental group was surveyed on entry to the program and on completion at six weeks. The comparison group was surveyed on two occasions two weeks apart with no intervening NE. Participants completed both questionnaires while at the CR program. Comparison group testing was designed to take place as close as possible to the same time frame as experimental testing to rule out extraneous influences that could impact on one group if tested at a different point in time.

## Survey Instruments

The pre-test questionnaire was identical to the one used in the Part 2 survey, as previously described (p. 110). The post-test questionnaire was a seven-page single-sided instrument identical to the pre-test instrument, except that the sociodemographic and background information section was omitted and instructions were added to inform participants that they should answer according to their present knowledge, attitudes and habits and not try to remember how they answered before (see Appendix 7).

## Survey Limitations

As discussed previously (pp. 98-99), there are several limitations to the use of surveys in general. Limitations regarding the design and delivery of the pre-test questionnaires have also been addressed previously (pp. 102-104). Responses to the post-test questionnaire may have been influenced by respondents' recall of their previous responses but the time interval between pre-test post-test delivery and the added instructions would possibly reduce this likelihood.

## **Data Analysis**

Methodology and statistical analyses used were developed in consultation with a biostatistician. SPSS for Windows Version 8.0 computer software was used for data analysis (SPSS, 1998). The level of significance for all statistical tests was less than 5% ( $p < 0.05$ ).

Descriptive statistics were used to describe the composition of the groups. Prior to calculating descriptive statistics, ratio data was tested for normality, using FS and FK statistics. Internal consistency was confirmed by reliability analysis using Cronbach's alpha.

Chi-square analysis was performed on nominal data to identify significant differences in proportions of people between the three NE groups, with Cramer's V statistics to assess the strength of the difference. This was followed by pairwise chi-square testing to determine which particular groups differed, with Phi statistics to assess the strength of the differences and a Bonferroni correction to reduce the chance of a Type I error due to multiple testing ( $p (.05)/\text{number of tests (3)} = \text{corrected } p < .017$ ).

One-way analysis of variance (ANOVA) was used for ratio and interval data to assess sociodemographic differences between groups and differences between pre-test scores, with Tukey's Honestly Significant Difference (Tukey's HSD) test for post-hoc comparisons. The Levene test was used to check that variances were not significantly different between groups. Analysis of co-variance (ANCOVA) was used to control for possible confounding variables.

Although ANOVA is regarded as robust to deviations from normality, especially when samples are equal and large (Runyon, Haber, Pittenger, & Coleman, 1996), if data were severely skewed or kurtic, non-parametric Kruskal-

Wallis tests were also performed, with Mann-Whitney pairwise comparison tests (with a Bonferroni correction for the three comparisons) to check for consistency with the ANOVA results.

Baseline differences in fat intake between the CR groups and the community were assessed by one-sample t-tests and CI. Paired-samples t-tests and CI were used to analyse differences between pre- and post-tests in each group. Differences in questionnaire scores between the CR groups and the PR group were analysed by one-way ANOVA, with post hoc Tukey's HSD and partial eta squared to determine the degree of association (Runyon et al., 1996). Cohen (Cohen, 1988) defines eta squared effect sizes as 0.01 = small, 0.06 = moderate and 0.14 = large. Pearson product moment correlations were used to determine the relationships between pre- and post-tests.

To evaluate the effectiveness of differing amounts of NE, an ANCOVA with the pre-tests as the covariates or a one-way ANOVA test of the mean differences between pre- and post-scores (gain scores) could be used. It could be argued that, as ANCOVA controls for the effect of pre-test scores, it is not necessary when pre-test scores are not significantly different. One of the assumptions of ANCOVA is that the relationship of the post-tests to the pre-test covariates is similar for all groups, as shown by similar regression slopes. To test this assumption, one-way ANOVA tests for interactions between pre-tests and NE group were performed and knowledge and attitude were not significant but fat intake was significant ( $F(2,234) = 7.04, p < .001$ ), indicating unequal regression slopes and unsuitable data for ANCOVA. As a slight age effect had been found for pre-test knowledge scores between the 1-hour and 4½-hour groups and unequal regression lines had been detected, a one-way ANOVA on the gain scores was

used to compare change in knowledge, attitude and intake between groups, with ANCOVA analysis controlling for pre-test scores for comparison. Partial eta squared was calculated to determine the degree of association. Tukey's HSD for equal variances or Tamhane post hoc testing for unequal variances were used to identify which groups differed. To test for possible confounding effects, ANCOVA was used.

Change in questionnaire items pre- and post-NE were analysed by paired-samples t-tests for knowledge items and Wilcoxon matched-pairs signed ranks tests for attitude and intake.

Factors associated with change were investigated by chi-square analysis, with Cramer's V or Phi, and independent-samples t-tests and CI. Pearson product moment correlations and scatterplots were used to determine if linear relationships existed between change scores.

Simultaneous multiple regression analysis was used for linearly-related variables to investigate factors associated with reduction in fat intake and change in knowledge, with adjusted  $R^2$  calculations to assess the amount of variance explained by the model. Prior to regression, data was inspected to ensure that there were no extreme outliers, multicollinearity or singularity and that normality, linearity and homoscedasticity assumptions were met.

## **Part 4 Methods: A Process Evaluation of Outpatient Cardiac Rehabilitation**

### **Participants' Satisfaction with Nutrition Education.**

Participants from seven CR programs (n = 261) with varying amounts of NE were surveyed by questionnaire on their satisfaction with the NE session(s) they had attended during 1997-2000. Participants in three community health centre (n = 86) and four hospital programs (n = 175) were included, with about half (47%) surveyed after one NE session of approximately one hour, 21% after two sessions (approximately two hours in total) and 32% after six or more sessions (approximately four and a half hours in total).

#### **Survey Method**

Satisfaction questionnaires were anonymous and, to ensure confidentiality, were either placed immediately in a sealed collection box or handed directly to the researcher. In programs with one or two NE sessions, questionnaires were distributed by the nutrition educator at the end of the session(s) for on-site completion. In programs with weekly NE sessions, the researcher gave questionnaires to participants at their final program session for on-site completion.

#### **Survey Instrument Development**

Items for inclusion in the questionnaire were derived from expected educational outcomes and were developed in consultation with nutrition educators and the Nutrition Manager and Cardiac Rehabilitation Manager of the HF. Eleven items related to participants' understanding, interest, confidence about dietary change and overall satisfaction, the relevance, usefulness and amount of information given and the educator's handling of questions and presentation style. A Likert box scale was used for these items, using the categories "strongly disagree", "disagree", "undecided", "agree" or "strongly agree". Three of these

statements were negatively phrased in an attempt to avoid acquiescence response set bias. “Agree” and “strongly agree” responses were regarded as positive, “disagree” and “strongly disagree” responses were regarded as negative, with reverse coding for negatively-phrased questions. Responses for each of the eleven questions were scored from one to five, with reverse coding for the negatively-phrased questions. Scores for the first ten questions, excluding the question on overall satisfaction, were summed to form a total satisfaction score. Possible total satisfaction scores ranged from ten to fifty, with a high score reflecting a high level of satisfaction.

Participants were asked if they would have liked more information on types of fats in foods, food labels, eating out, recipes, fibre, alcohol, low-fat foods, cholesterol, take-away food, weight loss, sugar and salt. They were also asked which type of educational methods were most helpful: lecture material, group discussion, video, slides, posters/charts, nutrition quizzes, overhead transparencies, food product displays or written handouts. These questions were in a closed “tick the box” format, with an open “other” category included for additional comments. An open-ended question about ways in which the NE session could have been improved and questions on age, gender and whether the respondent was a cardiac patient or accompanying a patient were also included.

The final questionnaire (see Appendix 8) was piloted and assessed for clarity and ease of completion and was found to be only slightly lower than desirable, with the ten-item scale having an internal consistency, as shown by a Cronbach alpha coefficient, of 0.77.



### Survey Limitations

General limitations of surveys have been discussed previously in this chapter (p. 98, 102-103). The main limitation of the satisfaction survey would be expected to be social desirability response bias. Also, in the programs in which the questionnaires were distributed by the nutrition educator, the presence of the educator may have affected responses, even though respondents put the questionnaires directly into a sealed collection box.

### Data Analysis

SPSS for Windows Version 8.0 computer software was used for data analysis (SPSS, 1998). The level of significance for all tests was less than 5% ( $p < 0.05$ ). Internal consistency was confirmed by reliability analysis using Cronbach's alpha. Descriptive statistics were used to describe responses. Pearson product moment correlation coefficients were used to assess the relationship between total satisfaction score, overall satisfaction and age, gender and type of participant. One-way ANOVA was used to analyse differences in satisfaction by age rank, amount of NE, CR program, gender and type of participant, with partial eta squared to determine the degree of association and Tukey's HSD or Tamhane post hoc tests.

## **Part 5 Methods: An Outcome Evaluation of Nutrition Education in Outpatient Cardiac Rehabilitation Programs.**

During the post-NE questionnaire delivery, CR participants in the experimental group at a hospital CR program having two forty-five-minute NE sessions (a total of one and a half hours) and a community health centre program with a single one-hour NE session were asked if they would agree to a follow-up contact. An associate researcher designed and carried out the data collection and arranged for the analysis of the food frequency questionnaire by the Anti-cancer Council (see Acknowledgements) but the analysis of all other data and interpretation of results were undertaken by the author.

### **Follow-up Survey Method**

In 1999, at approximately twelve months after the CR program, 71 participants who had agreed to follow-up were initially contacted by letter and then telephoned about one week later to request an interview. Nine did not wish to be interviewed, nine were unable to be contacted, five were unwell and two were deceased. Forty-six subjects (65%) agreed to take part but two were absent at the interview time. Approval was given by the Deakin University Ethics Committee and subjects who participated had been given a plain language statement and signed a consent form, as described in Part 2 methods (p. 101). Forty-four participants were interviewed for approximately one hour in their homes.

### **Survey Instruments**

The post-NE questionnaire was re-administered, together with a food frequency questionnaire (see Appendix 9) and questions on stage of change related to low-fat eating, additional heart complications and medical help required, additional CR attendance and dietary advice and continuation of suggested

exercise (see Appendix 10). Height and weight measurements were taken.

The food frequency questionnaire used was designed by the Anti-Cancer Council of Victoria and validated by the Melbourne Collaborative Cohort Study (Ireland, 1996). Ten questions were on usual eating habits for fruit, vegetables, milk, bread, spread, sugar, eggs and cheese over the past twelve months, four questions were on serving sizes eaten for potato, vegetables, steak and casseroles, seventy-four questions were on the frequency of eating foods in the categories of cereals, sweets, snacks, dairy foods, meats, fruit and vegetables and three questions were on alcohol consumption. The Anti-Cancer Council of Victoria optically scanned the questionnaires and calculated nutrient intakes by computer analysis using the NUTTAB 1995 database of Australian foods, which was the latest version available.

The stage of change questionnaire was derived from a model developed by Prochaska and DiClemente which identified five typical stages in the process of behaviour change: pre-contemplation, contemplation, preparation, action and maintenance (Prochaska & DiClemente, 1982). Stage of change questions for fat intake were the same as those used in a previous Australian study (McDonnell, Roberts, & Lee, 1998) and were in “tick the box” format, as were the questions on additional heart complications and medical help required, additional CR attendance and dietary advice and continuation of suggested exercise.

#### Survey Limitations

Survey limitations have been described previously in this chapter (pp. 102-104). The food frequency survey had been previously validated on a Melbourne population but not specifically on patients with CHD and differences in this population may have affected the results.

## **Data Analysis**

SPSS for Windows Version 8.0 computer software was used for data analysis (SPSS, 1998). The level of significance used for all statistical tests was less than 5% ( $p < 0.05$ ). Descriptive statistics were used to describe the composition of the group. Differences in BMI were analysed by paired samples t-tests and CI.

Using one-way repeated measures ANOVA tests, scores were compared across the three time periods (pre-NE, post-NE and one year follow-up) and partial eta squared was calculated to determine the degree of association. Mauchly's test of sphericity was used to check that assumptions of compound symmetry were met. Paired-samples t-tests were used to locate differences, with a Bonferroni adjustment for multiple comparisons.

Pearson's product-moment correlation analysis was used to determine relationships between questionnaire scores, stage of change, education rank, BMI and macronutrients. One-sample t-tests were used to assess differences in macronutrient intake between CR participants and the Australian population. Descriptive statistics were used to determine proportions of subjects eating specific types of foods. Independent-samples t-tests and CI and chi-square tests were used to compare male and female intakes.

Simultaneous multiple regression was used to determine factors associated with increased BMI, with adjusted  $R^2$  to assess the amount of variance explained by the model. Prior to regression analysis, data was inspected for extreme outliers, multicollinearity or singularity and normality, linearity and homoscedasticity assumptions were met.

## **Ethical Issues**

Permission to undertake this research project was obtained from Deakin University Ethics Committee and the hospitals and health centres involved in the study.

### **Privacy**

As a Part 3 post-tests needed to be correlated with the Part 2 pre-tests, names were recorded but codes were used on questionnaires and documents used in analysis. Data were securely stored during analysis and will be held for the requisite time. Individual results will not be viewed by, or released to, anyone other than the researcher.

### **Plain Language Statement**

Participants were fully informed of the purpose and nature of the study via a plain language statement.

### **Informed Consent**

Deakin University consent forms for questionnaires were used (Appendix 4). Participants were advised that they were free to withdraw at any time and that this would not affect their attendance at the CR program.

### **Stress/risk Level**

Every attempt was made to avoid inclusion of questions of a stressful nature in the survey questionnaire or test instruments. Subjects were free to leave items blank if they preferred not to disclose information. For Part 1, items were formulated in line with the objectives and no personal information was requested. For Part 2 and 3, questions were as brief as possible and restricted to basic demographic and background information, nutrition knowledge, attitudes and eating habits. Subjects were asked to write down their height and weight. For Part

4, questionnaires were anonymous and returned to the researcher via a collection box rather than to the nutrition educator and questions were confined to relevant information about satisfaction. For Part 5, participants were weighed and heights measured by consent and questionnaire items were confined to those relevant to their cardiac health and adherence to CR program recommendations.

## **CHAPTER 4**

### **Part 1 Results and Discussion: A Process Evaluation of Outpatient Cardiac Rehabilitation Programs in Victoria and the Nutrition Education Component.**

#### **Results**

##### **Preliminary Investigation**

General information preparatory to commencing research was obtained from the Cardiac Rehabilitation Manager of the HF, Victorian Branch. Patients having cardiac surgery are referred to CR programs by the treating hospital or physician and are contacted by the CR Coordinator about two weeks after discharge and invited to participate. CR programs are run on a continuous cycle of varying lengths and new patients join the next available session. Sessions usually comprise an exercise and education component and are offered once or twice weekly. Education often consists of a series of talks given by medical and ancillary personnel, with a different topic and speaker each session. Talks generally cover the anatomy and physiology of the heart, investigative and surgical procedures, cardiac drugs, the healing process and symptom management, resumption of physical, sexual and daily living activities, psychosocial issues and heart disease risk factors, which include diet and lifestyle advice. After leaving the program, patients are expected to continue the prescribed exercise and lifestyle, under their doctor's care. There are no follow-up outpatient programs offered but phase 3 CR programs are available in some areas. However, these are, as yet, relatively undeveloped. Victorian outpatient CR programs are continually evolving and are subject to frequent changes in personnel, funding and administrative decision-making.

## **Observation Results**

NE sessions in six Victorian outpatient CR programs were observed, four of which were hospital-based (three metropolitan and one rural) and two were community health centre-based (one metropolitan and one rural). Total numbers of participants in the program sessions observed ranged from twenty-seven at a large metropolitan hospital to three at a rural community health centre. Patients were predominantly male, some accompanied by female partners or relatives. Most participants appeared to be over fifty years of age, of normal weight or slightly overweight, Caucasian, and with good English language skills. Most patients were attending as a consequence of a MI or CABG and were at various stages of progress through the program.

In most cases, the venue was the physiotherapy gymnasium, which was usually a large open space containing exercise equipment and not always conducive to small group learning and discussion. In one venue, both participants and the nutrition educator were clearly and unavoidably distracted by continual noise and interruptions. In other venues with no extraneous distractions, most participants appeared to be interested and became involved in discussion, but there were considerable differences in the level of understanding between individuals, as shown by questions and comments. The atmosphere among participants at most venues appeared relaxed and friendly.

The main topics at each program were dietary fat and related topics such as food labels, low-fat food products, recipe modification and eating out. Other topics covered by some programs included blood lipids, body weight, salt, fibre, legumes, sugar, alcohol and general principles of healthy eating.

The education method in programs with larger numbers was lecture-style,



using overhead transparencies, a whiteboard and a question/answer format or food quiz to involve participants. Other programs with fewer numbers used either lectures or a combination of a talk and informal group discussion, combined with practical tasks such as reading food labels or viewing videos and food product samples. Most programs provided some handout material.

In all cases, the nutrition educator was a dietitian and appeared to provide high-quality information and was well prepared. The clarity of the presentation, handling of questions and rapport with patients varied. In some cases, delivery was rushed, food products were difficult to see as they were shown rather than passed around, overheads were cluttered, too small, too technical and sometimes hand written and there was insufficient time allotted to answer queries and clarify misunderstandings or confusion. In all cases, it seemed that it would have been helpful to provide a summary sheet of the information covered and the key points as, judging by the comments made, some participants appeared to be still confused by the end of the session.

All facilitators focused on increasing the nutrition knowledge of participants and none appeared to use individualised approaches or other behaviour change strategies in order to facilitate dietary change.

#### Observation Limitations

These have been discussed previously in Chapter 3: 'Methods' (p. 98).

#### Survey Results

There were seventy-four outpatient CR programs in Victoria and all were included in this survey. Fifty-six programs were run by hospitals, with four of these offering two types of programs, an accelerated program and a standard program. Eighteen programs were run by community health centres. Forty-three

programs were in country Victoria (33 of which were offered by hospitals) and the remainder were Melbourne-based.

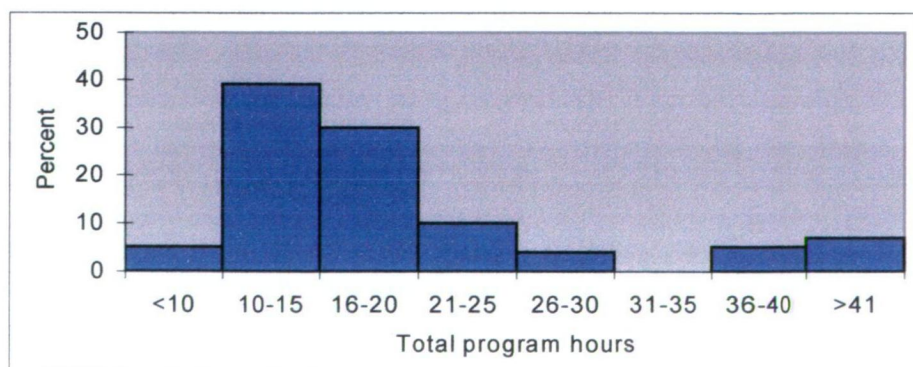
### CR Program Format

Program length ranged from three to nine weeks (mean 6, standard deviation (SD) 1). More than half the programs (57%) were six weeks in length, 14% were eight weeks, 13% were seven weeks, 10% were four weeks, with the remainder (6%) either three, five or nine weeks in length.

The number of CR sessions per program per week ranged from one to four (median 1). The most common program structure (65% of programs) was one session per week, with 29% offering two sessions, 4% offering three sessions and 2% offering four sessions. Hours for individual sessions ranged from one to four (mean 2.2, SD 0.5) In most programs (66%), the length of an individual session was two or two and a half hours.

The number of programs offered in a year ranged from one to twenty-five (mean 7.5, SD 3) and most programs ran on a continuous cycle with short breaks for public holiday periods, with two programs only offered on request.

The total number of hours per program, including exercise and education sessions, ranged from nine to seventy-two (mean 20.2, SD 13). Most programs (69%) were ten to twenty hours in total length (see Figure 1).

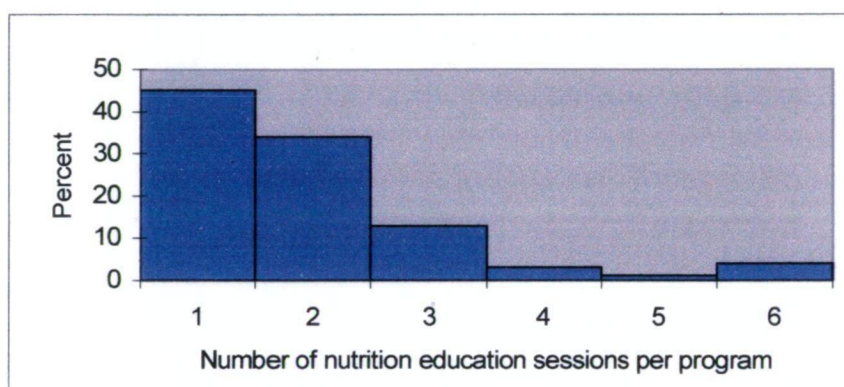


**Figure 1.** Total hours of cardiac rehabilitation programs.

Participant numbers ranged from three to forty (mean 13, SD 7). Most programs (91%) had between one and twenty participants.

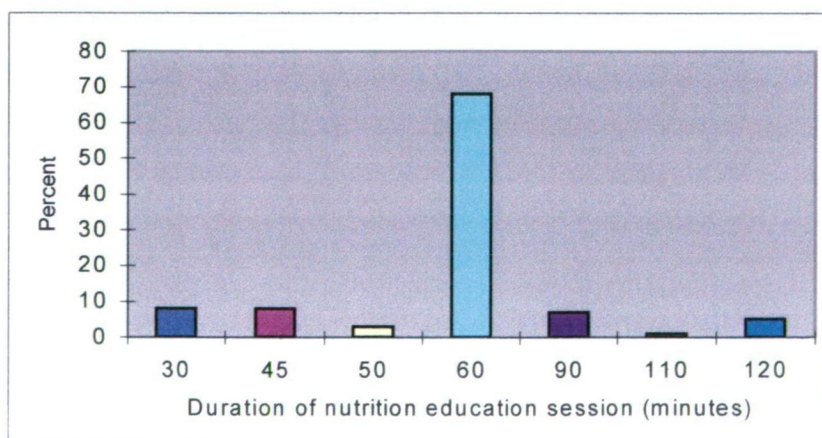
### Nutrition Education Format

All programs included NE. The number of NE sessions per program ranged from one to six (mean 2, SD 1), with almost half (45%) the programs incorporating one NE session, 34% with two, 13% with three and the remainder (8%) with four, five or six sessions (see Figure 2). Most programs (79%) had one or two NE sessions.



**Figure 2.** Number of nutrition education sessions per cardiac rehabilitation program.

The duration of each NE session ranged from half an hour to two hours. Most sessions (68%) lasted one hour (median 60 minutes) (see Figure 3).



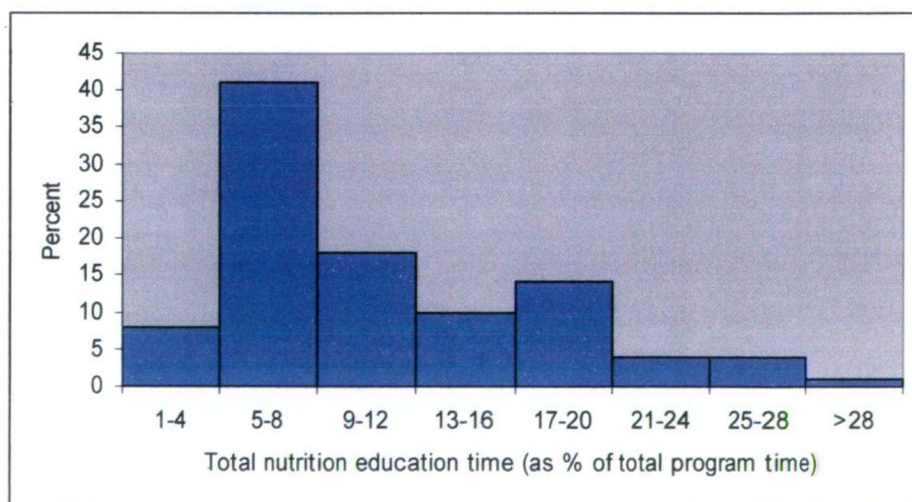
**Figure 3.** Duration of each nutrition education session.

Nineteen percent of programs had sessions lasting 30, 45 or 50 minutes and 13% had sessions of 90, 110 or 120 minutes. NE calculated as a percent of total program time ranged from 1-33% (mean 11%, SD 6.3%). For 59% of programs, NE occupied between 5 and 12% of program time (see Figure 4). Twenty-three percent of programs had a nutrition component of 17-33%.

Almost all programs (97%) had dietitians to facilitate the NE sessions. Two programs (3%) had a community health nurse as the facilitator.

Sixty-four programs (86%) claimed to have existing aims or objectives for NE, however, only forty-one (64%) of these had documented aims or objectives. Aims and objectives were very general and specific strategies and expected outcomes were not given.

All the topics listed under aims were found to fit into four main categories: general dietary advice, dietary factors associated with CHD, food selection or preparation and behaviour change strategies (see Table 1 and Figure 5).



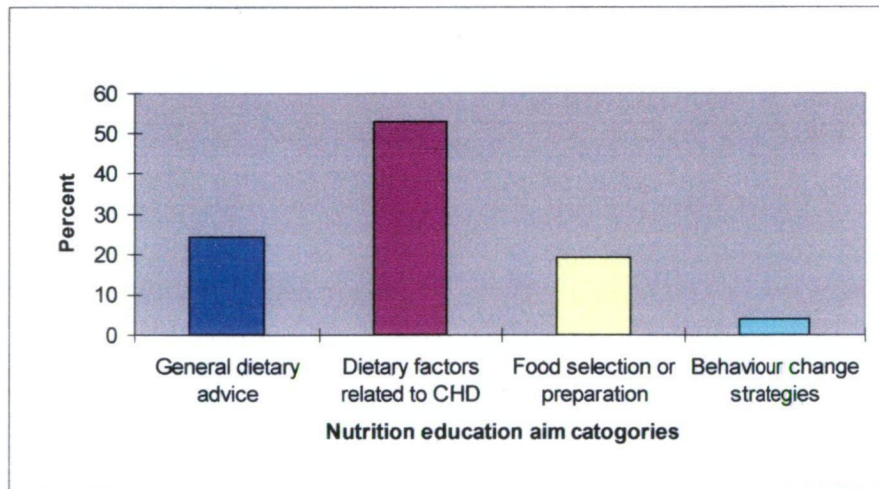
**Figure 4.** Total nutrition education time as a percent of total cardiac rehabilitation program time.

**Table 1**

Topics Listed as Aims for Nutrition Education (as a Percent of Programs Listing Aims)

Aims	%	Aims	%
<b>General dietary advice</b>		<b>Diet and CHD (cont.)</b>	
General healthy eating	33	Antioxidants	2
General nutrition education	16	Alcohol	2
General health improvement	2	<b>Food selection or preparation</b>	
<b>Diet and CHD</b>		Diet modification	18
General dietary risk factors	44	Food selection	9
Dietary fats	21	Food preparation	5
Body weight	12	Recipe modification	3
Blood lipids	9	Eating out	2
Sodium	7	<b>Behaviour change strategies</b>	
Dietary fibre	5	Confidence	3
Blood pressure	3	Empowerment	2
Healthy heart diet	3	Family participation	2
Sugar	2	Motivation	2

CHD=coronary heart disease



**Figure 5.** Topic categories for nutrition education aims (as a percent of programs listing aims)

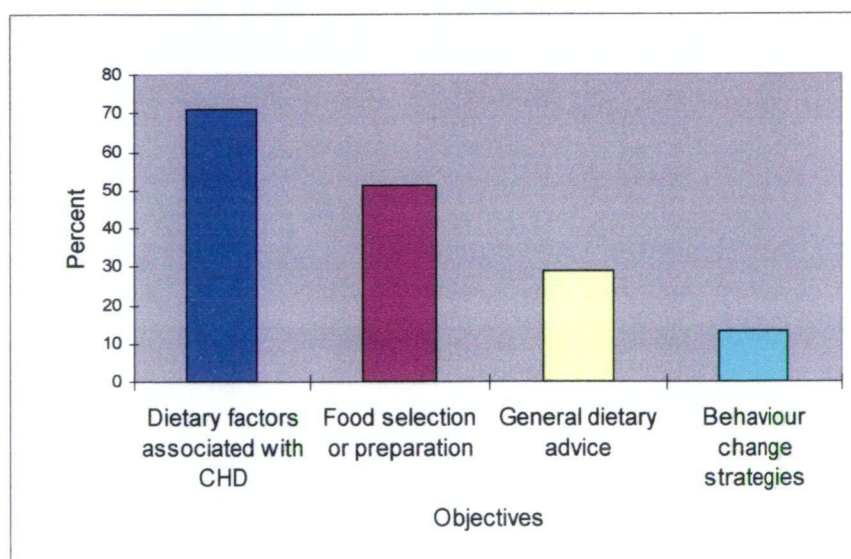
Most programs listed more than one aim, with most (53%) listing aims related to CHD dietary factors, about a quarter (24%) listing aims related to general dietary advice, 19% listing aims relating to food preparation or selection and only 4% listing aims related to behaviour change strategies.

Objectives of NE were similar to aims, with most (71%) relating to dietary factors related to CHD (see Table 2 and Figure 6).

**Table 2**  
**Topics Listed as Objectives for Nutrition Education (as a Percent of Programs Listing Objectives)**

Objectives	%	Objectives	%
<b>General dietary advice</b>		<b>Diet and CHD (cont.)</b>	
General healthy eating	27	Alcohol	2
General nutrition education	4	Legumes	2
<b>Diet and CHD</b>		<b>Food selection or preparation</b>	
Dietary fats	40	Food selection	33
General dietary risk factors	29	Food labels	29
Blood lipids	29	Diet modification	20
Body weight	29	Food preparation	20
Sodium	22	Recipe modification	11
Blood pressure	9	Eating out	7
Dietary fibre	9	<b>Behaviour change strategies</b>	
Antioxidants	7	Confidence	7
Omega-3 fatty acids	7	Understanding	4
Blood glucose	4	Family participation	2
Sugar	2	Motivation	2
Healthy heart diet	2		

CHD=coronary heart disease



**Figure 6.** Topic categories for nutrition education objectives (as a percent of programs listing objectives)

Fifty-one percent of program objectives related to food selection or preparation, 29% to general healthy eating and 13% to behaviour change.

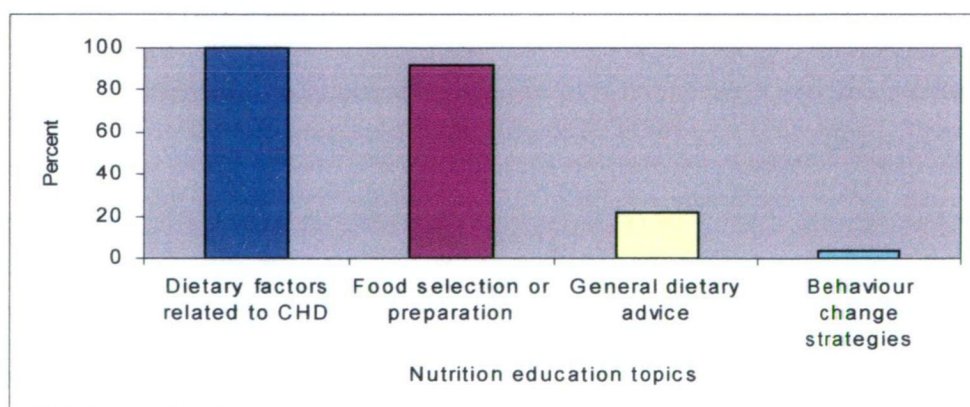
The content of NE reflected the main aims or objectives specified. The only topic covered by all programs was dietary fat (see Table 3). Topics reported by more than half were food labels (84%), and recipe modification (68%).

**Table 3**  
**Topics Listed as Nutrition Education Content (Percent of all Programs)**

Nutrition education topics	%	Nutrition education topics	%
<b>General dietary advice</b>		<b>Diet and CHD (cont.)</b>	
Dietary guidelines, food groups, food pyramid	23	Blood glucose	4
Resources available	3	Legumes	3
General healthy eating	1	Caffeine	3
<b>Diet and CHD</b>		<b>Food selection or preparation</b>	
Dietary fats	100	Food labels	84
Sodium	46	Recipe modification	68
Blood lipids	41	Food preparation	32
Body weight	39	Food selection	20
Dietary fibre	38	Eating out, take-away food	20
General dietary risk factors	31	Diet modification	4
Alcohol	28	Food tasting	1
Antioxidants	15	Food enjoyment	1
Omega-3 fatty acids	13	<b>Behaviour change strategies</b>	
Carbohydrates, sugar	13	Behaviour change	3
Blood pressure	12	Family participation/support	1

CHD=coronary heart disease

General content categories are shown in Figure 7. Some information on dietary factors related to CHD was covered by every program, some information on food selection or preparation was covered by 92%. General dietary advice related to healthy eating was given in 22% of programs and behaviour change strategies were included in 4%.



**Figure 7.** Nutrition education content categories (percent of all programs).

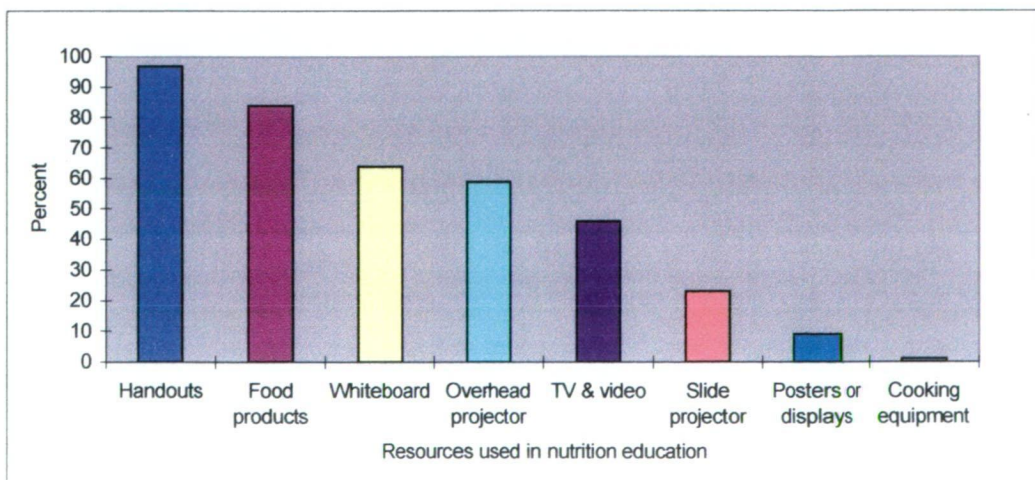
Most programs (89%) reported using combined educational techniques in NE, with half the programs using lectures with group discussion and practical

tasks and about a quarter (24%) using lectures with group discussion (see Table 4). The remaining combined techniques were group discussion with practical tasks (12%) and lecture with practical tasks (3%).

**Table 4**  
Educational Techniques used in Nutrition Education (Percent of All Programs)

<b>Nutrition education techniques</b>	<b>Percent</b>
<b>Combined techniques</b>	
Lecture, group discussion & practical tasks	50
Lecture & group discussion	24
Group discussion & practical tasks	12
Lecture & practical tasks	3
<b>Single techniques only</b>	
Lecture only	8
Group discussion only	3

Almost all programs (97%) provided handout material and most (84%) used food products for display or activities such as label reading (see Figure 8). More than half used educational resources that suited a more formal lecture-style delivery, such as whiteboard (64%) or overhead projector (59%). Videos were used in almost half the programs (46%), slide projectors in nearly a quarter (23%) and posters or displays in 9%. Only one program reported using cooking equipment.



**Figure 8.** Resources used in nutrition education (percent of all programs).



Programs appeared to conform to the HF objectives in terms of providing knowledge about diets for CHD but few showed evidence of using recommended behaviour change techniques to encourage dietary modification.

Nearly half of all programs (43%) had no participants with English language difficulties. Other programs relied on a relative being present to interpret (28%), referred the person to an individual consultation with an interpreter present (18%), provided written foreign language material (11%), used visual resources, referral or follow-up (5%) or had no resources to deal with this situation (11%) (see Table 5).

**Table 5**  
Resources used for Nutrition Education of Non-English-language Participants  
(Percent of Programs with Non-English-Language Participants)

Resources	Percent
Relative present at session to interpret	28
Referral to interpreted individual consultation	18
Written foreign language material	11
No resources	11
Visual material	3
Referral to interpreted group session	1
Outpatient follow-up	1

Aims, objectives and educational methods were compared to HF recommendations (National Heart Foundation, 1993). Some aspects of the aims of determining current knowledge of the link between diet and heart disease and clarifying, reinforcing and increasing knowledge of this area were covered by all programs. The aims of encouraging participants to modify their diet and introducing participants to ways of achieving this were less well addressed, as behaviour change techniques designed to facilitate this were rarely listed.

Most programs (72% ) used some method of evaluating NE. The most frequently-used methods were post-session questionnaire (57% of programs evaluated), group feedback (49%) and individual feedback (34%) (see Table 6).

**Table 6**  
Methods used to Evaluate Nutrition Education (Percent of Evaluated Programs)

<b>Evaluation method</b>	<b>Percent</b>
Post-session questionnaire	57
Group feedback	49
Individual feedback	34
Pre- and post-session questionnaire	17
Post-course questionnaire	9
Professional observer feedback	2
Letter follow-up	2
Telephone follow-up	1

Almost half (43%) of the evaluated programs used questionnaires only and 15% used informal feedback from participants only (see Table 7). Forty percent reported using a combination of evaluation methods, with the most frequent combination being a post-session questionnaire with feedback from participants (28% of evaluated programs).

**Table 7**  
Evaluation Methods used for Nutrition Education (Percent of Evaluated Programs)

<b>Evaluation method</b>	<b>Percent</b>
Questionnaire only	43
Post-session questionnaire and participant feedback	28
Participant feedback only	15
Pre- and post-session questionnaire and participant feedback	6
Post-course questionnaire and participant feedback	2
Post-session questionnaire, participant feedback and follow-up	2
Post-course questionnaire, participant feedback and follow-up	2
Participant and professional observer feedback	2

Nutrition facilitators were divided about whether participants would like more time spent on NE, with about half (49%) believing that they would.

Most nutrition educators (68%) reported barriers to the delivery of NE, 20% reported no barriers and 12% left the question unanswered. Of those reporting barriers, the majority (94%) of barriers were resource-related, nearly half (47%) were participant-related and 15% were venue-related.

The main resource barriers were limited time allocation for NE (42% of programs reporting barriers), limited dietitians' time for preparation and attendance at the programs (30%) and inadequate funding and resources (18%) (see Table 8). The main participant-related barriers were language difficulties (14%) and differing levels of needs and understanding (12%). Venue-related barriers included room size (8%), noise (4%) and room changes (2%).

**Table 8**  
Nutrition Educators' Perceived Barriers to Nutrition Education (Percent of Those Reporting Barriers)

<b>Perceived Barriers</b>	<b>Percent</b>
<b>Venue-related barriers</b>	
Room too small	6
Room noisy	4
Room too large	2
Room is changed frequently	2
<b>Participant-related barriers</b>	
Language difficulties	14
Differing needs/understanding	12
Group too large	6
Limited group discussion possible	6
Cultural differences	2
Group too small	2
Participants' attendance time required	2
<b>Resource-related barriers</b>	
Limited time allocated	42
Dietitians' time limited	30
Inadequate funding or resources	18
Lack of cooking facilities	2
Limited evaluation	2
Dietitian unavailable	2

Seventy-two nutrition educators (97%) gave suggestions for assistance from the HF. The type of assistance most often suggested was for provision of patient literature (75% of programs), evaluation instruments (74%) and professional papers (71%) (see Table 9).

**Table 9**  
Nutrition Educators' Suggestions for Assistance from the Heart Foundation  
(Percent of Those Making Suggestions)

<b>Assistance suggested</b>	<b>Percent</b>
Patient literature	75
Evaluation instruments	74
Professional papers	71
Program planning guidelines	56
Videos	26
Funding, resources (unspecified)	8
Foreign language literature	7
Overhead transparencies	6
Slides	6
Recipes	6
Posters	4
Free or low-cost resources	4
New product information	3
Food tasting	3
Activity ideas	3
Guest presenters	1

General comments were made by 43% of nutrition educators and covered a range of items including positive (70% of comments) and negative statements (49%) about participants, session time, content, feedback and venue (see Table 10).

**Table 10**  
Nutrition Educators' General Comments about Nutrition Education (Percent of Nutrition Educators Commenting)

<b>Comments</b>	<b>Percent</b>
<b>Positive comments</b>	
Participants are keen	22
Sessions are enjoyable	12
Feedback is positive	12
Program is being updated	12
Session time has increased	9
Participants are confident	3
<b>Negative comments</b>	
Participants forgetful	16
More time needed	12
Too much information to cover	6
Feedback needed	6
Participants have misperceptions	3
Practical activities needed	3
Local venue needed	3

## Discussion

### CR Program Structure

Most CR programs in Victoria were hospital-based and six weeks in length, with the duration of each session approximately two to two and a half hours. Numbers attending were relatively small in terms of the high incidence of CHD in Australia (Mathur, 2002), which supports recent research that has shown that only 32% of eligible patients attend CR in Victoria (Bunker, McBurney, Cox, & Jelinek, 1999).

### NE Time

The HF recommendations for CR programs, see Chapter 1 (p. 41-42), include offering education, discussion and counselling about risk factor modification and behaviour change skills, with individual assessment and referral, as required (National Heart Foundation, 1993). In this evaluation, all CR programs were found to include NE, which accords with the HF recommendations, and this is delivered by dietitians in almost all cases. However, NE is limited in most programs to one or two sessions and averages only 5-10% of program time. Learning and retention are poor after single educational sessions (Burke, 1981) and educational principles require that information is given over a period of time to allow for consolidation of information and the staged addition of new concepts (Lorig, 1996). This enables trial of new behaviours, feedback and problem-solving and enhances commitment to new eating patterns. There is much debate over the ideal cardiac diet and participants are likely to have received conflicting messages about the health effects of different foods, leading to confusion. The small amount of time allocated to NE in many programs would be inadequate to address all the important issues and a number of sequential NE

sessions would be required. Even in programs with several sessions, new patients enter the program each week and few would receive the information in the appropriate sequence.

### **Aims and Objectives of NE**

The HF recommends group education sessions for CR programs and objectives for NE are as follows (National Heart Foundation, 1993, p. 4):

1. To determine current knowledge of the link between diet and heart disease;
2. To clarify, reinforce and increase knowledge of this area;
3. To encourage participants to modify their diet;
4. To introduce participants to ways they may modify their diet.

Three major categories of aims, objectives and topics were identified: general dietary advice, dietary factors relating to CHD and food selection or preparation. Reported aims and objectives mainly related to general dietary advice and increasing knowledge about the dietary factors associated with CHD, as in the first two HF objectives. It appears that dissemination of information about dietary fat, food groups, balanced diets, label reading, shopping and food preparation is the main theme of NE in CR programs, which is a similar finding to that of a large-scale review of NE (Contento et al., 1995) and reflects the HF's emphasis on clarifying, reinforcing and increasing knowledge in this area.

Aims and objectives related to educational topics rather than behaviour outcomes. Aims or objectives relating to the third and fourth HF objectives for NE were not specifically reported by any program and only a very small number of programs reported aims, objectives or topics related to behaviour change, such as increasing confidence, empowerment, understanding, motivation and family

participation. However, it is possible that nutrition educators were using these in an informal way in the delivery of the program.

No programs mentioned individual assessment in the NE aims, objectives or content but this may have been because there were no specific items about this in the questionnaire.

### **NE Content**

NE content included information on dietary risk factors, which is in line with the first two of the HF objectives for NE. NE in CR programs would be expected to cover dietary factors associated with CHD, and especially the amount and type of fat in the diet, as this is a major component of secondary prevention (Expert Panel on Detection Evaluation and Treatment of High Blood Cholesterol in Adults, 2001; Krauss, Eckel, Howard, & et al, 2000; National Heart Foundation of Australia, 1999).

CR programs showed considerable variation in the content of NE, although the key topic, dietary fat, was common to all. Fewer than half the programs reported covering other dietary factors related to CHD. It may not be possible for a wider range of topics to be covered due to the extremely limited time allocation in many programs and it is probable that topics not listed are referred to briefly or covered in response to participants' questions.

### **NE Delivery and Resources**

The educational approach most commonly used was a didactic dissemination of information, which is not regarded as conducive to behaviour change (Contento et al., 1995). However, patients with CHD in an overseas study have been found to prefer structured, verbal teaching (Merritt, 1991) and, if applicable to Australian patients, the emphasis on lecture-style presentations may

be acceptable and necessary because of the need to cover a large amount of material in a very short time.

Group discussion was listed as an educational strategy in many programs but, it appears, from the observation research, that this may be restricted to questions from participants during the presentation, rather than a true group interaction. Cardiac patients have been found to prefer teaching methods that incorporate visual aids (Merritt, 1991) and videos and food products were used in most programs.

All CR education is in English and resources for non-English-speaking patients with CHD seem inadequate. These patients appear to be under-represented in the programs and it is possible that these patients may not be referred to programs or they may be unwilling to attend due to language barriers but further research is needed to determine this.

### **NE Evaluation**

A majority of programs reported evaluating NE but it is unclear from this survey how often evaluation is carried out or how the results are used. The most common method reported was a post-session questionnaire, which would be more suitable for a process evaluation. Pre- and post-session questionnaires required for impact evaluation were not commonly used and very few programs used pre- and post-course questionnaires and follow-up questionnaires to evaluate outcomes. Good quality NE evaluation appears to be under-utilised, probably because of the reported time and resource constraints, but is needed to assess outcomes and to provide important information on optimal time, session structure and educational strategies for effective NE.



## **Barriers to NE**

Many barriers reported related to factors outside the nutrition educators' control, such as time, funding and resources, and these may explain the small amount of NE in most programs and the lack of behavioural teaching strategies.

Although there is limited time for NE in most programs, educators were about evenly divided about whether participants would like more time on NE. Adult education principles endorse the use of a series of sessions (Girdano & Dusek, 1988) and one session has been found to be ineffective for learning (Burke, 1981). It seems unlikely that participants could understand all aspects of diets for heart disease, absorb and retain the information and have all their questions answered in a one-hour session. It may be that the restricted time for NE means that nutrition educators do not become aware of participants' needs or that the lecture-style format is inadequate for addressing these issues.

From discussions with CR coordinators, it appears that Victorian outpatient CR programs are continually evolving and are subject to frequent changes in personnel, funding and administrative decision-making. These factors would affect all program components including NE and may contribute to the variation in NE found among programs.

## **Hypothesis**

The hypothesis that NE is included in all Victorian outpatient CR programs was supported. The hypothesis that NE in CR programs accords with Heart Foundation recommendations was supported in terms of the HF's knowledge-based objectives but very little evidence was found that NE incorporates strategies relating to the objectives about encouraging patients to modify their diets and introducing them to ways of achieving this.

## CHAPTER 5

### Part 2 Results and Discussion: A Process Evaluation of Outpatient Cardiac Rehabilitation Participants' Characteristics and Nutrition Knowledge, Attitudes and Habits prior to Nutrition Education.

#### Results

Three hundred and seventeen participants in three hospital and two health centre outpatient CR programs in Melbourne, Victoria, were surveyed before exposure to NE to determine baseline characteristics and dietary fat knowledge, attitude to healthy eating and fat intake.

#### CR Participants' Characteristics

Characteristics of participants are shown in Table 11. Of the 317 participants, 73% were male and 77% were living with a spouse or partner.

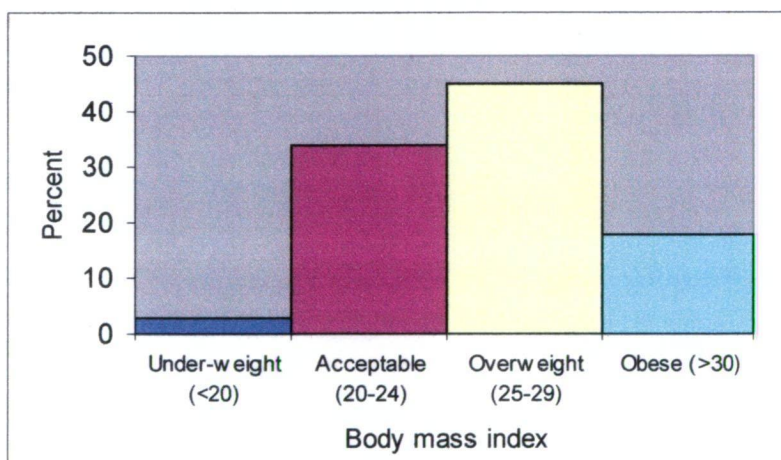
**Table 11**  
Characteristics of Cardiac Rehabilitation Participants

Characteristics	%	Characteristics	%
<b>Living arrangements</b>		<b>Highest education level</b>	
With spouse or partner	77	Primary	17
Alone	14	Secondary	49
With family or friends	9	Tertiary	34
<b>Employment</b>		<b>Preferred language</b>	
Retired	54	English	85
Employed or self-employed	31	Italian	5
Home duties	8	Greek	3
Unemployed	4	Croatian	1
Pension	3	Other	6
<b>Heart Disorders</b>		<b>Previous nutrition exposure</b>	
MI	46	Information accessed	80
CABG	38	Professional advice accessed	39
PTCA	22	Information only	46
Angina	17	Professional advice and information	34
High serum cholesterol	9	Professional advice only	5
Heart defects	8		

MI, myocardial infarction; CABG, coronary artery bypass graft; PTCA, percutaneous transluminal coronary angioplasty

Ages were approximately normally distributed (FS/SE = -2.39, FK/SE = -2.56, see Methods section, p. 110). Age ranged from 34 to 88 years (mean 64, SD11), with 40% aged 70 years or more. The mean age for men was 64 years (SD 11) and 66 years for women (SD11).

BMI, based on reported heights and weights, was slightly positively skewed and leptokurtic (FS/SE = 5.80, FK/SE = -7.10). BMI ranged from fourteen to forty-six (median 26.35, interquartile range (IQR) = 23.83 to 29.03). Three percent were underweight (BMI <20), 34% were in the acceptable weight range (BMI 20-24), 45% were overweight (BMI 25-29) and 18% were obese (BMI >30) (see Figure 9). Forty-eight percent of women were overweight and 20% obese and 44% of men were overweight and 17% obese.

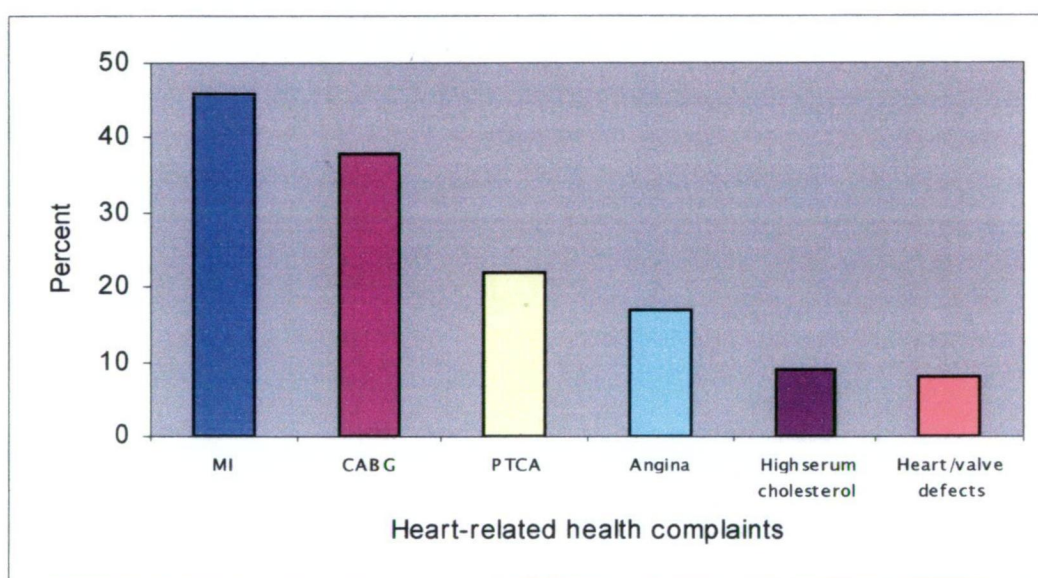


**Figure 9.** Body mass index of cardiac rehabilitation participants.

About half (49%) had attended primary and secondary school only, 34% had had some form of tertiary education (21% certificate or diploma level, 10% degree level, 3% post-graduate level) and 17% had attended primary school only. About half (54%) were retired, 31% employed or self-employed, with the remainder engaged in home duties (8%), unemployed (4%) or on a pension (3%).

Most participants (85%) reported English as their preferred home language. Of the nineteen other languages reported by the remainder, Italian (5%) and Greek (3%) were the most common.

Participants reported having had one or more heart-related health complaints and procedures, including MI (46% of participants), cardiac surgery (59%), consisting of CABG (38%) and PTCA (22%), and angina (17%), high serum cholesterol (9%) and heart and valve defects (8%) (see Figure 10). Only 11% had not had a MI or cardiac surgery.



MI, myocardial infarction; CABG, coronary artery bypass graft;  
PTCA, percutaneous transluminal coronary angioplasty

**Figure 10.** Heart-related health complaints reported by cardiac rehabilitation participants.

In almost all cases (93%), participants were referred to the program by a hospital before discharge, the remainder by a health professional after discharge (5%) or by another CR program (2%). All participants were surveyed before exposure to the NE component of the program. Just over half (56%) were surveyed at their first CR session, 13% on their second, 13% on their third and the remaining 18% at their fourth to sixth session.

Sixty-one percent came to the program unaccompanied, 33% were accompanied by their spouse or partner, 3% by a relative and 1% by a friend. Only 9% had previously attended a CR program, 3% within the last three years, the remainder between five and twenty-two years ago (median 8 years, IQR 1.33 to 13.6 years). Thirty-nine percent of those previously attending a CR program had not had a NE session in the program and 46% had attended one or two sessions only. The remainder (15%) had previously attended three to nine NE sessions.

Nearly two-thirds of participants (61%) had not been given any nutritional advice by a health professional before entering their current CR program. Only 21% had been given advice by a dietitian, 12% by a medical practitioner and 4% by a nurse (see Table 12). Most participants (80%) had received informal nutritional information from one or more other sources, including Heart Foundation or other patient handout literature (63%), family (22%), books (15%), radio and/or television (13%), newspapers (12%), popular magazines (11%), friends (11%), scientific journals (2%) and 2% from other sources including other CR program, the internet, weight-loss classes, naturopath, video and the Baker Institute.

**Table 12**  
**Nutrition Information Sources Reported by Cardiac Rehabilitation Participants**

<b>Nutrition information source</b>	<b>%</b>	<b>Nutrition information source</b>	<b>%</b>
Patient handout literature	63	Medical practitioner	12
Family	22	Popular magazine	11
Dietitian	21	Friends	11
Books	15	Nurse	4
Radio and/or television	13	Scientific journal	2
Newspaper	12	Other	2

Nearly half (46%) had accessed informal nutritional information only, 34% had received both professional nutritional advice and informal nutritional information, 5% professional nutritional advice only and 15% neither.

About a quarter of women (26%) lived alone compared to 11% of men, a small significant difference (chi-square = 11.24,  $p < .01$ , Phi = 0.19). Significantly more men (40%) had been educated at tertiary level than women (17%) (chi-square = 14.09,  $p < .001$ , Phi = 0.21) and significantly more men (36%) were still working than women (19%) (chi-square = 8.32,  $p < .01$ , Phi = 0.16), but differences were small. There were no significant differences between men and women for type of heart disease, being accompanied to the program, previous CR program attendance, receiving professional nutritional advice or gaining informal nutritional information prior to the program. Mean age and BMI were not significantly different between men and women.

The relationship of age with other sociodemographic variables was investigated and those employed, living with others and having tertiary education were significantly younger ( $t = 14.58$ ,  $p < .001$ , CI 13.14 to 17.24,  $t = 3.73$ ,  $p < .001$ , CI 3.02 to 9.79 and  $t = 3.11$ ,  $p < .01$ , CI 1.50 to 6.66, respectively).

### **CR Participants' Dietary Fat Knowledge**

Participants were asked whether twenty-one dietary fat statements were "True (T)" or "False (F)" (see Table 13).

Each correct response was scored "1", incorrect or blank responses were scored "0". Possible total scores were 0 to 21, with a high score reflecting a high level of dietary fat knowledge. Patient scores ( $n = 317$ ) were approximately normally distributed (FS/SE = -2.24, FK/SE = 1.80) and ranged from 0 to 21 (mean 10.37, SD 4.68). Internal consistency, as assessed by Cronbach's alpha,

was 0.84,  $r = 0.20$  for mean inter-item correlations.

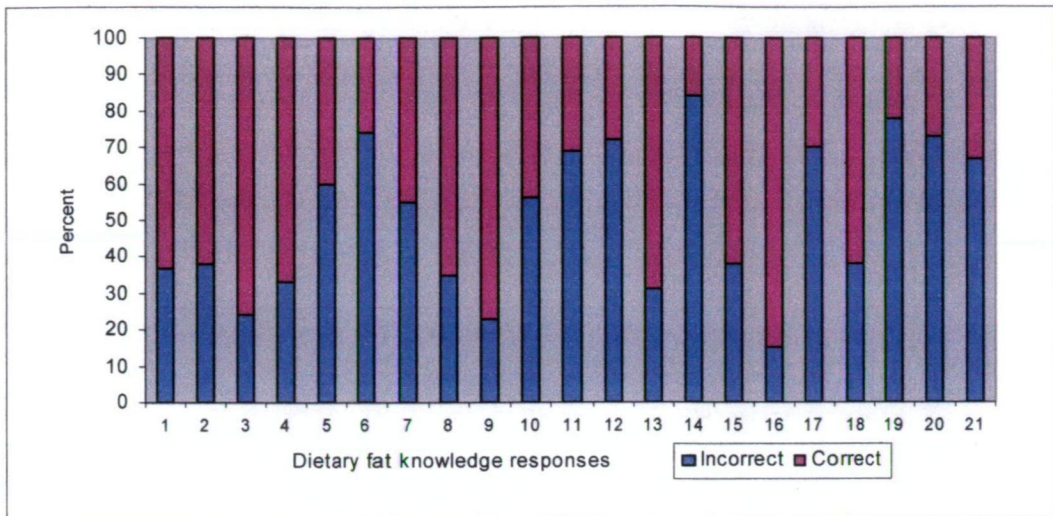
**Table 13**

Nutrition Knowledge Statements with Correct Responses

1	Cottage cheese contains more fat than cheddar cheese	F
2	Fat-trimmed, lean cuts of meat may contain less than 5% fat	T
3	The fats found in fish are beneficial in heart disease	T
4	Skinny milk contains less than 1% fat	T
5	Saturated fats are more likely to be liquid rather than solid	F
6	Cholesterol is found in all foods that contain fat or oil	F
7	Olive oil contains monounsaturated fats	T
8	Polyunsaturated fats are usually found in vegetable oils like sunflower and safflower oil	T
9	A meat pie contains more fat than a loaf of bread	T
10	Rev milk contains the same amount of fat as Skinny milk	F
11	Avocados contain cholesterol	F
12	Butter and margarine contain the same amount of fat	T
13	Roast potatoes are higher in fat than potato chips	F
14	If an oil has been hydrogenated, it has become less saturated	F
15	Farmhouse milk has less fat than regular milk	F
16	Sausages, frankfurts and salami are high-fat meat products	T
17	Toasted muesli is a low-fat breakfast cereal	F
18	Nuts contain less fat than kidney beans and lentils	F
19	Saturated and polyunsaturated fats have a similar kilojoule (calorie) value	T
20	If a food product contains only vegetable oils, it must be low in saturated fat	F
21	Seafoods contain polyunsaturated fat	T

T, true; F, false

The statement with the highest number of correct responses (85%) was statement 16 and the one with the highest number of incorrect responses (84%) was statement 14 (see Figure 11). About three-quarters gave correct answers to statement 3 (76% correct) and 9 (77%). About three-quarters incorrectly answered statement 6 (74% incorrect), 12 (72%), 17 (70%), 19 (78%) and 20 (73%). About two-thirds correctly answered statements 1 (63%), 2 (62%), 4 (67%), 8 (65%), 13 (69%), 15 (62%) and 18 (62%) and about two-thirds incorrectly answered statements 11 (69%) and 21 (67%). Over half answered statement 5 incorrectly (60%) and participants were about evenly divided for statements 7 (45% correct) and 10 (44% correct).



**Figure 11.** Dietary fat knowledge responses of cardiac rehabilitation participants.

### **CR Participants' Healthy Eating Attitudes**

Participants were asked whether they “strongly disagreed”, “disagreed”, “agreed”, “strongly agreed” or were “undecided” about ten healthy eating attitude statements (see Table 14). Possible total scores were 10 to 50, with a high score indicating a positive attitude.

Patient scores (n = 317) were normally distributed (FS/SE = 1.02, FK/SE = -0.44) and ranged from 26-49 (mean 36.18, SD 4.46). Participants agreeing or strongly agreeing with healthy eating statements and disagreeing or strongly disagreeing with unhealthy eating statements were classed as having positive responses and responses in the reverse were regarded as negative. Internal consistency, as assessed by Cronbach’s alpha, was 0.67,  $r = 0.17$  for mean inter-item correlations.

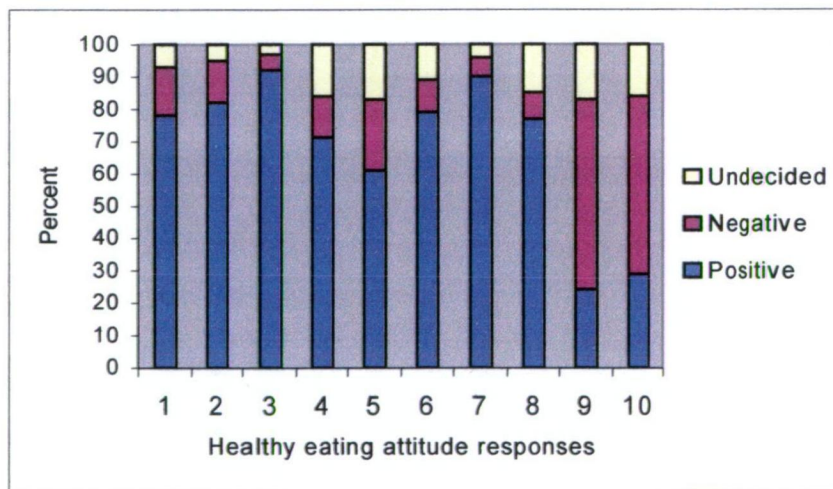
The statement with the highest number of positive responses (92%) was statement 3, followed by 7 (90%) (see Figure 12). Other statements with a high level of positive responses were statement 1 (78% positive), 2 (82%), 4 (71%), 6 (79%) and 8 (77%). The highest number of negative responses (59%) came from statement 9, followed by 10 (55%) and 5 (22%). Statements with a higher



number of undecided responses were 5 (17%), 9 (17%), 10 (16%), 8 (15%), 4 (13%) and 6 (11%). Although more than half of participants disagreed with item 10 about the taste of low-fat milk, 71% claimed to be using low-fat or reduced-fat milk exclusively.

**Table 14**  
Healthy Eating Attitude Statements

1	People who have been eating the same food all their life should not have to change now
2	There will be plenty of time later on to reduce fat and increase fibre in the diet
3	Starting a low-fat, high-fibre diet now will give benefits to health in the long term
4	Health food is more trouble for the cook and takes longer to prepare
5	Low-fat, high-fibre food is tasteless and bland
6	Changing to a low-fat, high-fibre diet is too complicated and difficult to do
7	Salads in season make an interesting and tasty meal
8	Once you are used to eating less fat you don't miss it at all
9	New diets are easier to start than to keep up
10	Low-fat milk tastes better than full-cream milk



**Figure 12.** Cardiac rehabilitation participants' attitudes to healthy eating.

**CR Participants' Fat Intake**

Participants were asked seventeen questions about the frequency of eating fat-containing foods, methods of cooking meat, amount of butter or margarine used on bread and type of milk used (see Table 15). Possible total scores were 0

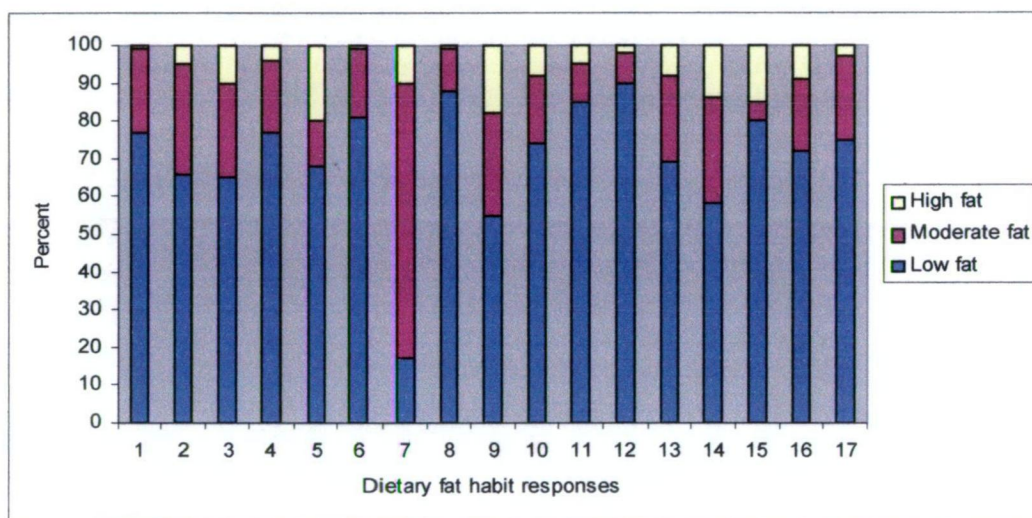
to 62, with a low score indicating a low fat intake. Participants' scores were approximately normally distributed (FS/SE = 2.94, FK/SE = 0.08) and ranged from 1 to 41 (mean 16.10, SD 7.33). Internal consistency, as assessed by Cronbach's alpha, was 0.83,  $r = 0.24$  for mean inter-item correlations.

In questions with five possible responses, the two categories indicating infrequent use of the food or small amounts of the food, such as "Never" or "Less than once a week", were classed as low-fat responses. Responses "Once or twice a week" were classed as moderate fat responses and responses "Three to five times a week" or "Six or more times a week" were classed as high fat responses. In questions with three possible responses, responses indicating that none of the food was eaten were classed as low-fat responses, responses indicating small amounts eaten were classed as moderate-fat responses and responses indicating larger amounts eaten were classed as high-fat responses.

**Table 15**  
**Fat Intake Questionnaire**

1	How often do you eat fried food with a batter or breadcrumb coating?
2	How often do you eat gravy, cream sauces or cheese sauces?
3	How often do you add butter, margarine, oil or sour cream to vegetables, cooked rice or spaghetti?
4	How often do you eat vegetables that are fried or roasted with fat or oil?
5	How is your meat usually cooked?
6	How many times a week do you eat sausages, devon, salami, meat pies, hamburgers or bacon?
7	How do you spread butter/margarine on your bread?
8	How many times a week do you eat chips or French fries?
9	How often do you eat pastries, cakes, sweet biscuits or croissants?
10	How many times a week do you eat chocolate, chocolate biscuits or sweet snack bars?
11	How many times a week do you eat potato crisps, corn chips or nuts?
12	How often do you eat cream?
13	How often do you eat ice cream?
14	How many times a week do you eat Cheddar, edam or other hard cheese, cream cheese or cheese like camembert?
15	What type of milk do you drink or use in cooking or in tea and coffee?
16	How much of the skin on your chicken do you eat?
17	How much of the fat on your meat do you eat?

Questions with eighty percent or more low-fat responses were numbers 12 (90%), 8 (87%), 11 (84%), 6 (81%) and 15 (80%) (see Figure 13). About three-quarters of participants had low-fat responses to 1 (78%), 4 (77%), 17 (75%), 10 (74%) and 16 (72%). About two-thirds of participants had low-fat responses to 13 (69%), 5 (68%), 2 (67%) and 3 (65%). About half the participants had low-fat responses to 14 (58%) and 9 (55%). Questions that had the highest number of “never” or “none eaten” responses were 17 (75%), 16 (72%), 12 (51%) and 11 (42%).



**Figure 13.** Dietary fat intake responses of cardiac rehabilitation participants.

### **CR Participants' Fat Intake Compared to that of an Australian Community**

Participants' mean score for dietary fat intake was compared to the mean obtained by an Australian community survey (Dobson et al., 1993). In this survey (n = 328), the scores ranged from 3 to 50 (mean 23.49, SD 7.57) and were approximately normally distributed. CR participants' mean fat intake score was significantly lower than the community mean (see Table 16). The mean fat intake of CR participants aged 56 years and over was also significantly lower than the mean for the equivalent age range in the community survey.

**Table 16****Cardiac Rehabilitation Participants' Fat Intake compared to that of an Australian Community Survey**

Group	No. of subjects	Mean scores	SD	t	95% CI	
					Lower	Upper
<b>Whole group</b>						
CR participants	314	16.10	7.33			
Community survey	328	23.49	7.57	17.87***	-8.21	-6.58
<b>Age 56 years or more</b>						
CR participants	230	16.18	6.95	9.19***	-5.11	-3.31
Community survey	94	20.39	8.43			

\*\*\*p<.001 (2-tailed)

SD, standard deviation; CI, confidence interval; NE, nutrition education; CR, cardiac rehabilitation

**CR Participants' Knowledge, Attitude and Fat Intake Compared to that of a Pulmonary Rehabilitation Group**

Patients with pulmonary disease attending a PR program were surveyed on entry to the program. In the PR group (n = 41), age ranged from 46 to 84 (mean 67, SD 8.7) and BMI ranged from 14 to 38 (median 23.39, IQR = 20.30 to 29.38). Twenty percent were underweight (BMI <20), 34% were in the acceptable weight range (BMI 20-24), 23% were overweight (BMI 25-29) and 23% were obese (BMI >30). There was no significant difference in age between the CR and PR groups but median BMI was significantly lower in the PR group (Mann-Whitney U = 3854.5, p<.05).

About half of the PR group were female (51%), all preferred to speak English at home and most were living with others (81%) and not employed (90%). Few were tertiary educated (13%) or had received professional nutritional advice (27%) but almost half had accessed some nutritional information (49%). None had previously attended a CR program and almost all (92%) reported very little difficulty in eating because of their lung disease, 8% reporting moderate

difficulty. High blood cholesterol and high blood pressure were reported as the most common health problems other than lung disease (27% each), followed by diabetes and heart disease (12% each). All patients with diabetes reported being on a special diet but less than half (46%) of those with elevated blood cholesterol and those with heart disease (40%) were on a special diet.

Patients with pulmonary disease tend to have a low BMI and are often prescribed weight-gaining diets. Twenty percent had a BMI below normal (less than 20) but none claimed to be on a weight-gaining diet.

The PR group, when compared to the CR group, had significantly more females (chi-square = 11.73,  $p < .001$ ), English-speakers (chi-square = 4.90,  $p < .05$ ) and unemployed participants (chi-square = 8.51,  $p < .01$ ) and fewer with tertiary education (chi-square = 8.95,  $p < .01$ ) and having accessed nutritional information (chi-square = 20.38,  $p < .001$ ).

Questionnaire scores for the PR group are shown in Table 17.

**Table 17**  
Cardiac Rehabilitation Participants' Dietary Fat Knowledge, Healthy Eating Attitude and Fat Intake compared to a Pulmonary Rehabilitation Group

Questionnaire Scores	Cardiac Rehabilitation Group (mean $\pm$ SD) (n=317)	Pulmonary Rehabilitation Group (mean $\pm$ SD) (n=41)
Dietary fat knowledge	10.31 $\pm$ 4.70	10.41 $\pm$ 4.36
Healthy eating attitude	36.14 $\pm$ 4.47	35.02 $\pm$ 5.41
Fat intake	16.10*** $\pm$ 7.33	23.68*** $\pm$ 8.55

\*\*\* $p < .001$  (2-tailed) SD, standard deviation

Dietary fat knowledge and attitude to healthy eating were not significantly different between PR and CR participants but the PR group had significantly

higher fat intakes ( $t = 6.11$ ,  $p < .001$ , CI -10.03 to -5.14, omega squared = 0.09), indicating that 9% of the variance was accounted for by group.

### **Mean Differences in Dietary Fat Knowledge, Attitude and Intake according to CR Participant Characteristics**

Differences were detected for dietary fat knowledge but some differences were very small (1.2 to 1.3) and not important in practical terms. Participants who had received nutritional advice from a health professional had slightly higher knowledge scores and those who had accessed nutritional information had moderately higher knowledge scores (see Table 18). Those aged 66 years or more were found to have a slightly lower level of knowledge than younger participants. Participants with tertiary education had moderately better knowledge but there were no significant differences between those with primary and those with secondary education only. Those preferring to speak English had slightly better knowledge. Mean knowledge scores for participants having had cardiac surgery were found to be slightly lower. More cardiac surgery patients had received professional nutritional advice (chi-square = 7.86,  $p < .01$ , Phi = 0.16) and were educated at tertiary level (chi-square = 6.06,  $p < .05$ , Phi = 0.14) but there were no differences in age, accessing nutritional information or speaking English.

For attitude, participants who had received nutritional advice from a health professional had slightly better scores and those accessing informal nutritional information and speaking English had moderately better scores. Those aged 65 or less were found to have a slightly better attitude, as did those who were employed.

For fat intake, participants who had received professional nutritional advice had a slightly lower intake, as did those having had cardiac surgery.

**Table 18**  
**Differences in Dietary Fat Knowledge, Attitude and Intake by Cardiac Rehabilitation Participants' Characteristics**

Group	Mean scores	SD	MD	t	95% CI		Omega squared
					Lower	Upper	
<b>Professional nutritional advice (n=122)</b>							
Knowledge	11.11	4.70	1.32	2.46*	0.27	2.37	0.02
Attitude	36.96	4.45	1.32	2.58*	0.31	2.33	0.02
Intake	14.36	7.14	-2.92	3.50**	-4.56	-1.28	0.03
<b>Nutritional information (n=253)</b>							
Knowledge	10.97	4.56	3.28	5.19***	2.04	4.53	0.08
Attitude	36.75	4.41	3.04	5.04***	1.85	4.22	0.07
Intake	15.50	7.31	-2.99	2.92**	-5.00	-0.98	0.02
<b>Age 66 years and over (n=153)</b>							
Knowledge	9.24	4.59	-2.08	4.01**	1.06	3.10	0.05
Attitude	35.33	4.36	-1.56	3.13**	0.58	2.53	0.03
<b>Tertiary education (n=105)</b>							
Knowledge	12.23	4.37	2.82	5.26***	-3.88	-1.76	0.08
<b>Previous Cardiac Surgery (n=187)</b>							
Knowledge	10.76	4.50	1.11	2.07*	-2.16	-0.05	0.01
Intake	15.23	7.10	-2.12	2.54*	0.48	3.77	0.02
<b>English language (n=270)</b>							
Knowledge	10.56	4.76	1.71	2.32*	-3.16	-4.34	0.01
Attitude	36.59	4.43	2.99	4.35***	-0.26	-1.64	0.05
<b>Employed (n=99)</b>							
Knowledge	11.81	4.51	2.18	3.91***	-3.28	-1.08	0.04
Attitude	37.35	4.16	1.76	3.30**	-2.81	-0.71	0.03

\*p<.05 (2-tailed) \*\*p<.01 (2-tailed) \*\*\*p<.001 (2-tailed)

SD, standard deviation; MD, mean difference; CI, confidence interval

Mean age, BMI and mean scores for knowledge, attitude and fat intake were not significantly different between men and women. No other significant differences were found in any mean scores and controlling for age did not alter any of the results.

**Relationships between Dietary Fat Knowledge, Healthy Eating Attitude, Fat Intake and CR Participants' Characteristics**

There was a significant positive and moderate correlation between knowledge and attitude, a significant negative and moderate correlation between attitude and intake and a significant negative and weak correlation between knowledge and intake (see Table 19). More knowledge was associated with a more positive attitude and a more positive attitude was associated with a lower fat intake, but more knowledge was only weakly related to a lower fat intake. There were no significant correlations between age and intake, but age and attitude and age and knowledge had weak negative relationships, indicating that older age was associated with less knowledge and a less positive attitude.

**Table 19**  
**Correlation Matrix for Significant Associations between Dietary Fat Knowledge, Attitude to Healthy Eating, Fat Intake, Body Mass Index and Age in Cardiac Rehabilitation Participants**

	<b>Knowledge</b>	<b>Attitude</b>	<b>Intake</b>	<b>Age</b>	<b>Body Mass Index</b>
<b>Knowledge</b>	-	0.33*** n=317	-0.20*** n=314	-0.19*** n=316	ns
<b>Attitude</b>	-	-	-0.33*** n=314	-0.17*** n=316	ns
<b>Intake</b>	-	-	-	ns	ns
<b>Age</b>	-	-	-	-	-0.13* n=288

\*p<.05 (2-tailed) \*\*\*p<.001 (2-tailed) ns, not statistically significant

BMI was significantly and negatively related to age, indicating that BMI was slightly lower in older participants but BMI was not associated with knowledge, attitude and intake. Age in men was also weakly associated with higher fat intake ( $r = 0.15, p < .05$ ). Age in women was more strongly associated



with less knowledge ( $r = -0.34$ ,  $p < .01$ ) but attitude and intake were not significant. Controlling for age, the relationships between knowledge, attitude and intake remained significant and of similar strength.

Simultaneous multiple regression analysis was used to analyse factors associated with fat intake. The final model was found to be moderately and significantly associated with fat intake ( $F(3, 307) = 16.64$ ,  $p < .001$ , adjusted  $R^2 = 0.13$ ), accounting for thirteen percent of the variance in fat intake (see Table 20). Beta values were negative, indicating that a lower fat intake was associated with a better attitude, having received professional nutritional advice and being female but the low  $R^2$  means that most of the variance can be attributed to other factors not included in this model.

**Table 20**  
**Simultaneous Multiple Regression Analysis of Factors Associated with Fat Intake in Cardiac Rehabilitation Participants**

Independent Variable	Regression Model (adjusted $R^2 = 0.13$ )		
	B	SE	Beta
Intercept	35.32	3.17	
Attitude to healthy eating	-0.49	0.09	-0.30***
Previous professional nutritional advice (No=0, Yes=1)	-2.45	0.80	-0.16**
Gender (Male =0, Female = 1)	-1.91	0.88	-0.12*

\*  $p < .05$  (2-tailed) \*\* $p < .01$  (2-tailed) \*\*\* $p < .001$  (2-tailed) B, unstandardised coefficients; SE, standard error; Beta, standardised coefficients; CABG, coronary artery bypass graft

As attitude was strongly related to intake, further regression analysis was carried out with attitude as the dependent variable and the final model was significant ( $F(3,313) = 23.05$ ,  $p < .001$ , adjusted  $R^2 = 0.17$ ) and of moderate strength, accounting for seventeen percent of the variance in attitude (see Table

21). Positive beta values indicated that a better attitude was associated with more knowledge, speaking English in the home and having obtained previous nutritional information but there were low numbers of non-English-speaking participants, which is a limitation of the model.

**Table 21**  
Simultaneous Multiple Regression Analysis of Factors Associated with Attitude to Healthy Eating in Cardiac Rehabilitation Participants

Independent Variable	Regression Model (adjusted R <sup>2</sup> = 0.17)		
	B	SE	Beta
Intercept	34.18	1.14	
Dietary fat knowledge	0.24	0.05	0.25***
English language preferred (No=0, Yes=1)	2.45	0.65	0.19***
Previous nutritional information (No=0, Yes=1)	2.14	0.59	0.19***

\* p<.05 (2-tailed) \*\*p<.01 (2-tailed) \*\*\*p<.001 (2-tailed)

B, unstandardised coefficients; SE, standard error; Beta, standardised coefficients;  
 CABG, coronary artery bypass graft

## **Discussion**

### **Participants' Characteristics**

The sociodemographic characteristics of CR participants tended to reflect the expected characteristics of Australian patients with CHD, namely a predominance of older, overweight men from an English-speaking background. The proportion of men attending and the mean ages of men and women were very similar to those of a previous study of Victorian CR participants (Dobson et al., 1993). There were fewer CABG patients in this study but similar proportions of MI and PTCA patients. As the CR programs in this study catered only for English speakers, as did the questionnaire, it is not surprising that few non-English speakers were included in this survey.

### **BMI**

BMI was calculated from reported heights and weights but is expected to be reasonably accurate as most had been weighed as part of their cardiac assessment and/or were self-monitoring their weight. Values are as expected, given the high prevalence of overweight in the Australian population (Mathur, 2002) and the fact that overweight and obesity is a risk factor for CHD (Field et al., 2001). In this study, the proportion of men overweight and obese was similar to that reported by the AIHW for men in 1999-2000 (Mathur, 2002) but the proportion of overweight or obese women was greater. It would be expected that patients with CHD would lose some weight after having surgery and BMI values may well have been higher before this.

An American study has found that a large number of CR participants are overweight on entry to the program, possibly reflecting the prevalence of overweight in American populations. However, this is especially important in

patients with CHD as overweight is associated with a more adverse CHD risk profile (Bader, Maguire, Spahn, O'Malley, & Balady, 2001). The American Heart Association regards weight management as one of the core components of CR programs and recommends identifying overweight patients by measuring BMI and/or waist circumference and specifically targeting them for intervention (Balady et al., 2000).

### **Type of Heart Disease**

As expected, most participants were MI and/or cardiac surgery patients but few reported having high serum cholesterol. This was unexpected, given the strong link between elevated serum cholesterol and heart disease, and may reflect the patients' ignorance or confusion about their true medical condition or the fact that successful treatment has normalised a previously high level. The American Heart Association (Balady et al., 2000) regards identifying and targeting CR patients with elevated blood lipids as a core component of CR programs and advises that weight management and nutritional counselling should be part of the strategy for addressing this issue.

Cardiac patients surveyed were in various stages of discomfort after their procedures and were not able to drive themselves to the venue, yet most came unaccompanied. Travel difficulties have been identified as barriers to attendance in rural CR programs (Schulz & McBurney, 2000) and this may also be relevant in urban programs. Some centres provided transport for participants and this would obviously be needed, especially for those economically disadvantaged and the frail elderly. Those who made their own arrangements to attend are likely to be a more motivated group of patients and this may affect compliance with diets for heart disease.

## **Previous Nutrition Exposure**

Most patients had not had any nutritional advice from a health professional prior to attending the program. In spite of the large amount of evidence about the diet and heart disease link, it seems that few medical practitioners are discussing dietary modification with their patients or referring them to dietitians for such advice. As lipid-lowering drugs have been found to have a greater effect than diet and lifestyle change in secondary prevention in some studies (Hunninghake, Stein, Dujovne, & et al, 1993), doctors may believe that dietary change is now less important. Also, as doctors have limited time with patients and may have inadequate dietary knowledge, drug therapy may be the preferred option for many. Alternatively, doctors may prefer to give patients written nutritional material, as demonstrated by the large number of CR participants who had received nutritional information in the form of HF or other medical literature. The source of such material was not identified and patients may have obtained this directly from the HF or from other sources, rather than their doctor.

Few patients had been given advice by a dietitian, a unexpected finding in view of the fact that they had been recently hospitalised but may reflect the increasingly busy workload of hospital dietitians. From discussions with dietitians at various CR programs, it appears that the main avenue for provision of dietary advice to patients with CHD is the CR program. It would therefore be important to ensure that all patients with CHD have access to these programs and are encouraged to attend and that NE is allotted sufficient time to be effective. It may be more appropriate to give dietary advice in outpatient programs as retention of information is impaired if given during a stressful time (Cupples, 1991), such as

during the inpatient period following cardiac surgery.

The majority of patients had obtained dietary information from sources other than health professionals, mainly from patient handout literature, possibly indicating that CR participants perceive the importance of diet in secondary prevention and are seeking to take more control over their disease. Family members were a significant source of nutritional information and the quality of information from this source would vary widely. It appears that patient handout literature is the most common resource but the quality of this information would be dependent on the source of the literature.

### **Dietary Fat Knowledge, Attitudes and Intake**

The rationale for using this survey format, the development of the knowledge, attitude and fat intake questions and the limitations have been covered in the Methods section (Chapter 3, pp. 101-109). Although the attitude questions were developed for, and validated by, Victorian CR participants, the internal consistency was lower than desirable in this study, reducing the validity of the results. The internal consistency of the knowledge and fat intake questions was found to be satisfactory in this study.

The fat intake questionnaire had been validated by comparison with a well-established food frequency questionnaire in a previous Australian study (Dobson et al., 1993). In this study, total fat score correlated strongly with the amount of total fat, saturated fat and cholesterol and the percent of energy from fat and saturated fat obtained from analysis of another well-established Australian food frequency questionnaire (Ireland, 1996) (see Part 5 Results, Chapter 8, p. 214). However, the fat intake questionnaire was found to have several limitations.

Total fat score also moderately correlated with PUFA and MUFA values

from the food frequency questionnaire but these fats are not regarded as contributing to CHD risk (Howard et al., 1995; Hu et al., 2000) and, therefore, references to oil may not be relevant. Although nuts contain saturated fat, they also contain MUFA and PUFA and are considered beneficial (Hu & Stampfer, 1999) and it is not desirable to associate nuts with less beneficial foods such as potato crisps and corn chips in item 11. The questionnaire does not assess intake of other foods containing undesirable fats, such as high saturated fat snack foods, doughnuts, paté and organ meats.

Some patients were unsure how to respond to items 13 and 14 relating to ice cream and cheese intake, respectively, as they were eating low-fat varieties of these foods. It would be preferable to use the term “regular ice cream” and “regular cheese” to avoid confusion or incorporate low-fat varieties in the questionnaire.

A high score on some items that may not be of great concern has the potential to skew the results e.g. item 5 about how meat is cooked and item 15 about the type of milk used. If full-fat milk is used, it may be used so rarely or in such small amounts that it has little impact on fat intake. Similarly, the cooking method used for meat may not be important if it is eaten rarely.

Knowledge of dietary fat was generally poor in terms of specific types of fats and amounts in foods and this is similar to the findings of other studies (Buttriss, 1997; Paisley, Lloyd, Sparks, & Mela, 1995). Most participants were aware of high-fat meat products and the benefits of fish. Knowledge was better in those receiving professional advice or other nutritional information and in younger patients, those speaking English, those employed and with tertiary education. Cardiac surgery patients had slightly more knowledge, which may be

because more had accessed professional nutritional advice and had a higher level of education.

Attitude is a difficult concept to measure and the attitude questionnaire used in this study related to attitude to general healthy eating rather than dietary fat. The lower internal consistency for the attitude scale is likely to reduce the accuracy of the analysis and the results need to be interpreted cautiously.

Attitude to healthy eating was found to be positive, a finding similar to that of an American study of patients with CHD (Johnson & Vickery, 1990), and was better in those younger, speaking English and employed and in those accessing nutritional advice or information. It may be that knowledge affects attitude or attitude is a motivating factor in accessing knowledge.

Scores were higher for awareness of the benefits to health and the need for change. However, participants were less positive about the taste of low-fat foods and being able to continue the changes in the longer term. Strategies aimed at increasing self-efficacy (Bandura 1982) and preventing dietary lapses may be useful in NE.

Although most participants disagreed with the statement that low-fat milk tastes better than full-cream milk, a large number of those disagreeing were using low-fat or reduced-fat varieties exclusively. It appears that taste may not be an important factor in patients with CHD, a similar finding to that of a previous Australian survey of fat intake (Crawford & Baghurst, 1990). If taste is found to be a barrier to low-fat diets, it may be helpful to encourage participants to explore different low-fat food options to find those that are more acceptable.

Total fat intake score was low overall and scores were particularly low for items relating to meat fat, chicken skin, dairy fat, potato chips, fatty snacks and



fatty meat products. CR participants appear to be aware of the need to cut down on animal fat in general but cheese and pastries, cakes, sweet biscuits or croissants were eaten more frequently, which may be because the fat content is not so obvious in these foods or intake of these foods is more difficult to reduce or limit.

Those who had received previous professional nutritional advice or information and cardiac surgery patients had lower fat intakes but the difference was small. Fear of heart surgery is a strong motivator for dietary compliance (Falk, Bisogni, & Sobal, 2000) and this may have encouraged these patients to access and act on nutritional information or advice. A Canadian study has reported that MI and PTCA patients make considerable dietary changes post-hospitalisation (Gaw-Ens & Laing, 1994) and a study of MI patients found that almost all had reduced their fat intake after diagnosis and before inpatient CR (Koikkalainen, Mykkanen, Julkunen, Saarinen, & Lappalainen, 2002). Therefore, it appears that CR participants are likely to have reduced their fat intake prior to entry to the outpatient program.

### **Differences between CR Participants and Non-CR populations**

In the Australian community survey (Dobson et al., 1993) and in the PR group, fat intake scores were significantly higher than those of the CR group, despite the PR group having a similar level of knowledge and attitude and most having accessed either professional nutritional advice or other nutritional information. However, the lack of randomisation of PR subjects and differences in characteristics between the PR and CR population, such as BMI differences, limit interpretation of the results.

Although the pre-event diet was not investigated in this study, most

Australians would be aware of the link between dietary fat and CHD as this has been widely publicised over several decades. The 1995 National Nutrition Survey (Australian Bureau of Statistics, 1997) has shown that older Australians eat less fat and cholesterol than younger people. CR participants are older and knowledge of having heart disease appears to motivate patients to make dietary changes (Falk, Bisogni, & Sobal, 2000; Koikkalainen, Mykkanen, Julkunen, Saarinen, & Lappalainen, 2002; Sivarajan et al., 1983; Gaw-Ens & Laing, 1994); therefore CR participants are likely to have better diets than the general population. Also, most patients in this study were found to have previously accessed nutritional information and all these factors would be expected to contribute to dietary improvement.

#### **Factors associated with Dietary Fat knowledge, Attitudes and Intake**

Fat intake was lower in those accessing professional nutritional advice, which could indicate that knowledge is a motivating factor in dietary modification or, alternatively, that patients motivated to modify their diets are more likely to seek out information. Fat intake was also lower in women and it may be that women are more aware of nutritional advice and more likely to comply with dietary recommendations than men.

Age was not related to fat intake, indicating that CR participants of all ages are able to follow a low-fat diet, in spite of less knowledge and poorer attitudes to healthy eating in the elderly.

A positive attitude to healthy eating was found to be more strongly associated with a low fat intake than dietary fat knowledge. This could mean that attitude may be more associated with compliance with a low-fat diet than knowledge, as has been found in other studies (Shepherd & Stockley, 1987;

Wright, 1994). Deficiencies in the attitude questionnaire may have affected the results and it cannot be concluded from this evidence that a positive attitude causes patients to adopt a healthier diet. Attitude and knowledge were also associated but, again, it cannot be demonstrated that attitude has an effect on knowledge or vice versa.

It would be expected that patients with a higher BMI would either be eating more fat, thus causing their excessive weight, or less fat, due to efforts to lose weight, but fat intake was not associated with BMI.

The regression analysis of fat intake is difficult to interpret as there may be unknown contributing or confounding factors. Identifiable factors associated with a lower fat intake were a better attitude, having received professional nutritional advice and being female, although these factors accounted for only a small amount of the variance. Male patients may have more difficulty with dietary modification or may not be convinced of the benefits of cardiac diets and could require different educational approaches.

Better knowledge, English language skills and having accessed nutritional information were significant predictors of positive attitude but the amount of variance accounted for by these factors was also small. A positive attitude may cause patients to access nutritional information and therefore improve knowledge and, conversely, accessing nutritional information may improve attitudes to healthy eating. It is also possible that a two-way interaction occurs, with attitude reinforcing knowledge and knowledge reinforcing attitude. As very few participants were non-English-speaking in this survey, the significance of this association with attitude is uncertain. As most nutritional information is in English, non-English speakers would be disadvantaged and nutritional

information handouts in other languages or interpreters may need to be provided in order to improve knowledge and possibly impact on attitude.

## CHAPTER 6

### **Part 3 Results and Discussion: An Impact Evaluation of Nutrition Education in Outpatient Cardiac Rehabilitation Programs.**

#### **Results**

Participants (n = 240) attending three hospital and two health centre outpatient CR programs in Melbourne, Victoria, who had previously been surveyed for baseline dietary fat knowledge, attitude to healthy eating and fat intake, were included. One health centre and one hospital program became one of the experimental groups, with participants (n = 80) having a total of approximately one hour of formal NE (one 50 or 60-minute session per program). One hospital program became a second experimental group with participants (n = 80) having a total of 4½ hours of formal NE (one 45-minute session each week for 6 weeks) and additional access to the dietitian at one exercise session per week. One health centre and one hospital program became a comparison group (n = 80), with no exposure to formal NE. A PR group (n = 41) from the second experimental hospital became a non-CR comparison group for baseline observations.

#### **NE in the Experimental Groups**

In the 1-hour community health centre group, NE consisted of an informal round-table talk to about 10-12 participants covering general principles of healthy eating based on the Healthy Diet Pyramid, types of foods high in fat, label reading and low-fat cooking methods. No formal aims and objectives were documented and no teaching aids were used, except for food products. Participants were able to ask questions throughout the presentation and were given handouts which included the Healthy Diet Pyramid, label reading, the fat

content of various types of cooked potatoes, “best” cereal choices, “good” cereal choices, “not recommended” cereal choices, low-fat cooking hints and ways to reduce fat intake from meat, dairy foods and hidden fat.

In the 1-hour hospital group, NE consisted of a lecture-style presentation to about 12-15 participants, covering dietary fat and recipe modification or label reading and low-fat shopping and supported by overhead transparencies and videos. The dietary fat session included a food quiz, which was completed by participants during the session, sample tastings of low-fat recipes, recipe handouts and a handout on the amount of fat in common foods. Food products were used in the label reading and low-fat shopping session.

In the 4½-hour group, there were six documented modules for NE, one for each 45-minute session, consisting of aims, objectives, equipment used and facilitator’s notes. Talks were delivered in a lecture-style mode, with about 20-25 participants sitting in rows facing the speaker, and questions were used at intervals to stimulate discussion. Participants were able to ask questions throughout the talks. Module 1: “The Cholesterol and Fat Confusion” aimed to explain the nutrition-related risk factors for CHD, emphasising serum cholesterol and triacylglycerol levels and the role of dietary fats and cholesterol, and used overhead transparencies and food products. Module 2: “Food Sources of Fat” aimed to help participants identify fat in various food items and used slides and a quiz. Module 3: “Hypertension, Weight, Alcohol and Salt” aimed to increase awareness of dietary factors contributing to hypertension, emphasising weight control, alcohol and salt intake, and used overhead transparencies. Module 4: “Fibre” aimed to explain the importance of fibre for general health and in lipid control and used food products, cereal samples and bowls for demonstration, and

handouts. Module 5: "Eating Out, Take-away Food and Supermarket Shopping" aimed to assist with making healthy food choices at home and when away from home and used overhead transparencies, restaurant menus, food products, food label displays and handouts. Module 6: "Low-fat Cooking and Recipe Modification" aimed to demonstrate low-fat cooking methods and recipes and used overhead transparencies, cooking videos, cookbooks and handouts. The dietitian also attended one of the twice-weekly exercise sessions and participants were able to discuss more specific, individual issues while undertaking the prescribed exercises.

### **Participant Attrition**

Most participants in the first experimental group were present to complete the post-test after a 2-week interval but sixteen participants in the second experimental group failed to attend for the post-test at six weeks. In this group, eighty people completed the trial. Reported reasons for dropping out included ill health, lack of interest, lack of time and work and holiday commitments.

### **NE Group Characteristics**

Characteristics of each NE group are summarised in Table 22.

The age of participants ranged from 37 to 80 years in the comparison group, 44 to 86 years in the 1-hour group and 37 to 80 years in the 4½-hour group. BMI ranged from 18 to 37 in the comparison group, 17 to 46 in the 1-hour group and 14 to 41 in the 4½-hour group, with mean values for all groups in the overweight range ( $\geq 25$ ). The number of pre-survey CR sessions attended ranged from zero to four in the comparison group, zero to six in the 1-hour group and was zero in the 4½-hour group.

In all groups, most participants were male, preferred to speak English at

home, had previously accessed some nutrition information and lived with others. About half or less in all groups were accompanied to the program. Less than half were currently employed, educated at tertiary level or had received previous professional nutrition advice and few had previously attended a CR program. Most participants were MI and/or cardiac surgery patients.

**Table 22**  
**Differences in Characteristics between Experimental and Comparison Cardiac Rehabilitation Groups**

Characteristics	Comparison (n=80)	1-hour NE (n=80)	4½-hour NE (n=80)
Age (years) (mean ± SD)	62 ± 10.5	69*** ± 9.5	62 ± 10.9
Body mass index (mean ± SD)	26.4 ± 3.8	26.0 ± 4.4	27.4 ± 4.5
Male (%)	80	71	74
English language (%)	92	94	81
Living with others (%)	85	85	86
Accompanied (%)	53	45	24**
Tertiary education (%)	45	38	29
Employed (%)	42*	22*	31
Total MI patients (%)	44	35**	58**
Cardiac surgery patients (%)	52	50	65
Total PTCA patients (%)	9	9	35***
Total CABG patients (%)	44	40	32***
Previous cardiac rehabilitation (%)	9	10	9
Professional nutrition advice (%)	40	45	29
Informal nutrition information (%)	81	83	79

\*p<.05 (2-tailed) \*\* p<.01 (2-tailed) \*\*\* p<.001 (2-tailed)

NE, nutrition education; SD, standard deviation; MI, myocardial infarction; PTCA, percutaneous transluminal coronary angioplasty; CABG, coronary artery bypass graft

### **NE Group Differences in Sociodemographic Characteristics**

The number of MI patients differed weakly between groups (chi-square = 7.96, p<.05, Cramer's V = 0.18), with the 4½-hour group having more MI patients than the 1-hour group (chi-square = 7.77, p<.01, Phi = 0.22). PTCA



patient numbers were moderately larger in the 4½-hour group (chi-square = 25.21,  $p < .001$ , Cramer's  $V = 0.33$ ) and CABG patients were moderately fewer (chi-square = 16.72,  $p < .001$ , Cramer's  $V = 0.27$ ). There was a small significant difference in employment status (chi-square = 7.38,  $p < .05$ , Cramer's  $V = 0.17$ ), with the one-hour NE group having significantly fewer employed people than the comparison group (chi-square = 7.29,  $p < .01$ ,  $\Phi = 0.21$ ). The number of patients accompanied differed weakly (chi-square = 14.67,  $p < .01$ , Cramer's  $V = 0.25$ ), with fewer accompanied in the 4½-hour group. There were no significant differences between groups for other variables.

Age and the number of pre-survey sessions attended were approximately normally distributed. There were moderate significant differences between groups for age (see Table 23). There was no difference between the comparison group and the 4½ hour NE group but the 1-hour NE group was significantly older than the comparison group ( $MD = 7.54$ ,  $p < .001$ ) and the 4½-hour NE group ( $MD = 6.75$ ,  $p < .001$ ). The 4½-hour NE group had not attended any previous sessions, significantly fewer than the comparison ( $p < .001$ ) and 1-hour groups ( $p < .001$ ), and the 1-hour group had attended significantly more previous sessions than the comparison group ( $p < .01$ ). As BMI values were severely skewed in the 1-hour group ( $FS/SE = 5.96$ ,  $FK/SE = 10.72$ ) and slightly leptokurtic in the 4½-hour NE group ( $FK/SE = 2.4$ ), both parametric and non-parametric tests were used to determine differences between the three groups, but no significant differences were found.

**Table 23**

Analysis of Variance of Differences in Age and Number of Pre-survey Sessions Attended between Experimental and Comparison Cardiac Rehabilitation Groups

Source of variance	SS	df	MS	F
Age (years)				
Between group	2724.64	2	1362.32	12.80***
Within group	25126.07	236	106.47	
Total	27850.70	238		
No. of pre-survey CR sessions				
Between group	211.53	2	105.77	66.04***
Within group	373.18	233	1.60	
Total	584.71	235		

\*\*\*p<.001 (2-tailed) SS, sum of squares; df, degrees of freedom; MS, mean square; CR, cardiac rehabilitation

**Pre-test Dietary Fat Knowledge, Intake and Attitude to Healthy Eating by NE Group**

Mean pre-test scores for dietary fat knowledge, fat intake and healthy eating attitude by NE group are shown in Table 24.

**Table 24**

Pre-test Mean Scores for Dietary Fat Knowledge, Healthy Eating Attitude and Fat Intake for Cardiac Rehabilitation Comparison and Experimental Groups

Pre-test	Comparison (n=80) Mean ± SD Range	1-hour NE (n=80) Mean ± SD Range	4½-hour NE (n=80) Mean ± SD Range
Dietary fat knowledge	10.59 ± 4.75 0-21	11.30* ± 4.38 0-18	9.99* ± 4.42 0-21
Healthy eating attitude	37.11 ± 4.24 28-49	36.85 ± 4.54 27-48	35.70 ± 4.46 27-47
Fat intake	15.55 ± 7.37 4-35	15.56 ± 7.58 2-35	16.80 ± 6.91 2-38

\* p<.05 (2-tailed), when age-controlled. NE, nutrition education; SD, standard deviation

Scores were approximately normally distributed (FS/SE and FK/SE <2 or >-2), except for the pre-knowledge scores for the 1-hour NE group which were slightly negatively skewed (FS/SE = -3.12).

No significant differences were found between the NE groups for pre-test knowledge, attitude and fat intake. As significant between-group differences in demographic and other characteristics had been identified, the relationship between these and the pre-test scores was also tested. A significant moderate and negative correlation was found for age and pre-test dietary fat knowledge score in the 1-hour NE group (Pearson's  $r = -0.35$ ,  $p < .01$ ), indicating that older patients had poorer scores in this group.

When controlling for age, pre-test knowledge scores were found to be significantly but weakly different between NE groups ( $F(2,238) = 3.33$ ,  $p < .05$ , partial  $\eta^2 = 0.03$ ), accounting for only 3% of the group variance, the 1-hour group having a significantly higher pre-test knowledge score than the 4½-hour group ( $MD = 1.86$ ,  $p < .05$ ). Employment status, number of pre-survey sessions attended, English as the preferred language, type of heart disease and being accompanied to the program had no confounding effects on any pre-test scores.

#### **Differences in Pre-test Fat Intake between CR Participants and an**

#### **Australian Community**

Mean pre-test scores for fat intake for each NE group were compared to the mean obtained from an Australian community survey (Dobson et al., 1993) (see Table 25). In this survey ( $n = 328$ ), the scores ranged from three to fifty and were approximately normally distributed. It was found that the each NE group's mean fat intake score was significantly lower than the community mean. The mean fat intake of each of the NE groups aged fifty-six years and over was also significantly lower than the mean for the equivalent age range in the community survey.

**Table 25**

**Mean Scores for Pre-test Fat Intake for Cardiac Rehabilitation Participants Compared to those of an Australian Community Survey**

Group	Number of subjects	Mean scores	SD	t	95% CI	
					Lower	Upper
<b>Whole group</b>						
Comparison	80	15.55	7.37	9.63**	-9.58	-6.30
1-hour NE	80	15.56	7.58	9.35**	-9.61	-6.24
4½-hour NE	80	16.80	6.91	8.66**	-8.23	-5.15
Community survey	328	23.49	7.57			
<b>Age 56 years or more</b>						
Comparison	56	15.73	7.06	4.94**	-6.55	-2.77
1-hour NE	68	15.79	7.61	4.98**	-6.44	-2.75
4½-hour NE	54	16.70	6.38	4.25**	-5.43	-1.94
Community survey	94	20.39	8.43			

\*\*p<.001 (2-tailed) SD, standard deviation; NE, nutrition education; CI, confidence interval

### **Relationships between Dietary Fat Knowledge, Intake and Attitude to**

#### **Healthy Eating at Post-test**

In the comparison group, post-test intake scores were significantly and weakly associated with attitude ( $r = -0.29, p < .05$ ), indicating that a lower fat intake was associated with a better attitude score but intake and knowledge showed no association. In the 1-hour group, post-test intake scores were significantly, negatively and moderately associated with post-test knowledge ( $r = -0.38, p < .01$ ) and post-test attitude ( $r = -0.42, p < .001$ ), indicating that a lower fat intake was associated with better knowledge and attitude.

In the 4½-hour group, post-test intake scores were significantly, negatively and weakly associated with post-test attitude scores ( $r = -0.27, p < .05$ ), indicating that a lower fat intake was associated with better attitude, but intake was not significantly associated with knowledge.

For all the CR participants as a group, post-test intake was significantly and weakly associated with post-test knowledge ( $r = -0.23, p < .001$ ) and

moderately with post-test attitude ( $r = 0.34, p < .001$ ). Post-test knowledge and attitude were weakly, significantly associated ( $r = 0.28, p < .001$ ). Age was not a confounder in any of the results.

### **Correlations between Pre- and Post-test Dietary Fat Knowledge, Intake and Attitude Scores within Groups**

There were significant, positive, medium-to-large correlations between pre- and post-tests in all groups. In the comparison and 1-hour groups, there were large correlations for pre- and post-knowledge scores ( $r = 0.72, p < .01$ ;  $r = 0.56, p < .01$ , respectively), pre- and post-attitude scores ( $r = 0.75, p < .01$ ;  $r = 0.65, p < .01$ , respectively) and pre- and post-intake scores ( $r = 0.86, p < .01$ ;  $r = 0.85, p < .01$ , respectively). In the 4½-hour group, there were moderate correlations for pre- and post knowledge scores ( $r = 0.48, p < .01$ ), pre- and post-attitude scores ( $r = 0.48, p < .01$ ) and pre- and post-intake scores ( $r = 0.70, p < .01$ ).

### **Pre- and Post-test Differences in Dietary Fat Knowledge, Intake and Attitude to Healthy Eating within Groups**

Post-tests for dietary fat knowledge, healthy eating attitude and intake were also found to be approximately normally distributed (FS and  $FK < 2$  or  $> -2$ ), except for the post-test fat intake score in the comparison group, which was slightly positively skewed (FS = 2.75). Mean scores for pre- and post-tests are shown in Table 26.

In the comparison group, there was a small, significant improvement at post-test in knowledge and fat intake but no difference in attitude. In the 1-hour group, the only significant improvement was a moderate increase in knowledge. In the 4½-hour group, there were large improvements in knowledge and moderate improvements in attitude and intake.

**Table 26****Pre-and Post-test Mean Scores and Mean Differences for Dietary Fat Knowledge, Healthy Eating Attitude and Fat Intake for Experimental and Comparison Groups**

<b>Tests</b>	<b>Comparison (n=80)</b>	<b>1-hour NE (n=80)</b>	<b>4½-hour NE (n=80)</b>
<b>Pre-test dietary fat knowledge</b>			
Mean ± SD	10.6 ± 4.8	11.3 ± 4.4	10.0 ± 4.4
Range	0-21	0-18	2-20
<b>Post-test dietary fat knowledge</b>			
Mean ± SD	12.6 ± 3.6	13.0 ± 3.3	13.5 ± 3.3
Range	2-21	6-20	6-20
Mean difference	2.03	1.70	3.52
t	5.51**	4.08**	7.78**
CI	-2.76 to -1.29	-2.53 to 0.87	-4.43 to -2.62
<b>Pre-test healthy eating attitude</b>			
Mean ± SD	37.1 ± 4.2	36.8 ± 4.5	35.7 ± 4.5
Range	28-49	27-48	27-47
<b>Post-test healthy eating attitude</b>			
Mean ± SD	37.1 ± 4.1	37.4 ± 4.1	38.7 ± 4.3
Range	29-48	27-47	29-50
Mean difference	0.02	0.52	2.97
t	0.08	1.29	5.98**
CI	-0.68 to -0.63	-1.33 to 0.28	-3.97 to -1.98
<b>Pre-test fat intake</b>			
Mean ± SD	15.5 ± 7.4	15.6 ± 7.6	16.8 ± 6.9
Range	4-35	2-35	4-38
<b>Post-test fat intake</b>			
Mean ± SD	13.6 ± 7.4	14.7 ± 6.9	12.2 ± 5.4
Range	0-38	2-33	1-29
Mean difference	-1.94	-0.84	-4.55
t	4.48**	1.84	8.22**
CI	1.08 to 2.80	-0.07 to 1.75	3.45 to 5.65

\*\*p<.001 (2-tailed) NE, nutrition education; SD, standard deviation; CI, 95% confidence interval

**Pre- and Post-test Differences in Dietary Fat Knowledge, Intake and****Attitude to Healthy Eating between Groups**

Results are reported in Table 27. There were significant differences in improvements between groups in knowledge, attitude and intake. Partial eta squared values showed that 4% of the difference in knowledge, 11% of the difference in attitude and 12% of the difference in fat intake could be attributed to NE group.

**Table 27****Analysis of Variance of Mean Change in Scores for Dietary Fat Knowledge, Healthy Eating Attitude and Fat Intake between Experimental and Comparison Cardiac Rehabilitation Groups**

Source of variance	SS	df	MS	F	Partial eta squared
<b>Dietary fat knowledge change</b>					
Between group	150.10	2	75.05	5.48**	0.04
Within group	3242.55	237	13.68		
Total	3392.65	239			
<b>Healthy eating attitude change</b>					
Between group	398.80	2	199.40	14.35***	0.11
Within group	3293.85	237	13.90		
Total	3692.65	239			
<b>Fat intake change</b>					
Between group	581.81	2	290.90	15.54***	0.12
Within group	4435.37	237	18.71		
Total	5017.18	239			

\*\*p<.01 (2-tailed) \*\*\*p<.001 (2-tailed) SS, sum of squares; df, degrees of freedom; MS, mean square

The 4½-hour NE group had a significantly greater improvement in knowledge and fat intake than the 1-hour and comparison group (see Table 28). The 4½-hour group's attitude was also significantly more improved than the 1-hour and comparison groups. Results were similar for fat intake, with the 4½-hour group showing significantly lower consumption of fat than the 1-hour and comparison groups. There were no significant differences in change in scores between the 1-hour and comparison groups. ANCOVA analysis, controlling for pre-test scores, gave similar results.

As differences existed between NE groups for age and the number of pre-survey sessions attended, ANCOVA analysis of change in scores was used to control for these variables but these were not found to affect the results.

Change in individual questionnaire items after NE in the 1-hour and 4½-hour NE groups can be found in Appendix 11.

**Table 28****Post Hoc Analysis of Mean Change in Scores for Dietary Fat Knowledge, Healthy Eating Attitude and Fat Intake between Experimental and Comparison Cardiac Rehabilitation Groups**

Dependent variable	MD	CI	
		Lower	Upper
<b>Dietary fat knowledge change</b>			
1-hour NE and comparison	-0.35		
4½-hour NE and comparison	1.48*	-2.85	-0.10
4½-hour NE and 1-hour NE	1.83**	-0.45	3.20
<b>Healthy eating attitude change</b>			
1-hour NE and comparison	0.50		
4½-hour NE and comparison	2.95***	1.51	4.39
4½-hour NE and 1-hour NE	2.45**	-4.00	-0.90
<b>Fat intake change</b>			
1-hour NE and comparison	1.10		
4½-hour NE and comparison	-2.61***	-4.22	-1.01
4½-hour NE and 1-hour NE	-3.71***	-5.32	-2.11

\*p<.05 (2-tailed) \*\*p<.01 (2-tailed) \*\*\*p<.001 (2-tailed) MD, mean difference; SE, standard error

**Change in Dietary Fat Knowledge, Intake and Attitude to Healthy Eating in the 4½-Hour NE Group**

In the 4½-hour group, scores ranged from -5 to 13 for knowledge change, positive values indicating improved knowledge. Nine participants (11%) had lower knowledge scores, nine (11%) had no change and 62 (78%) had higher scores. Of those with higher scores, the mean improvement was 5.02 points (SD 3.17). For attitude change, scores ranged from -9 to 13, positive values indicating improved attitude. Seventeen participants (21%) had lower attitude scores, six (7%) had no change and 57 (72%) had higher scores. Of those with higher scores, the mean improvement was 5.04 points (SD 3.30). For fat intake change, scores ranged from -19 to 6, negative values indicating a reduction in fat intake. Twelve participants (15%) had higher intake scores, six (7%) had no change and 62 (78%) had lower scores (lower fat intake). Of those with lower scores, the mean reduction was 6.4 points (SD 3.89).



For knowledge, those who improved had a significantly lower pre-test knowledge score ( $t = 4.99, p < .001, CI 3.11$  to  $7.24$ ). Those improving in attitude also had a significantly lower pre-test attitude score ( $t = 5.24, p < .001, CI 3.10$  to  $6.90$ ) and those reducing fat intake had a significantly higher pre-test fat intake score ( $t = 4.41, p < .001, CI -10.66$  to  $-4.03$ ).

### **Factors Associated with Change in Dietary Fat Knowledge, Intake and Attitude to Healthy Eating in the 4½-Hour NE Group**

Pre-test scores for each variable were significantly, strongly and negatively related to change scores for the same variable (for knowledge,  $r = -0.69, p < .001$ , for attitude,  $r = -0.54, p < .001$  and for intake,  $r = -0.62, p < .001$ ), indicating that change scores improved more in those patients with poorer scores initially. Change in knowledge and change in fat intake were moderately and negatively related ( $r = -0.36, p < .01$ ), showing that a reduction in fat intake score was associated with improvement in knowledge score. Change in attitude did not show a significant relationship to the other change variables. Controlling for age and PTCA did not alter the results.

Those who had reduced their fat intake in the 4½-hour group ( $n = 62$ ) were mainly male (74%), with a mean age of 64 years (SD 10.40). Mean pre-NE scores for these subjects were 9.9 (SD 4.5) for knowledge, 35.7 (SD 4.5) for attitude and 18.5 (SD 6.4) for fat intake. After NE, there were significant improvements in these subjects for knowledge ( $t = 7.6, p < .001, CI -5.1$  to  $-3.0$ ), attitude ( $t = 6.0, p < .001, CI -4.5$  to  $-2.2$ ) and intake ( $t = 13.0, p < .001, CI 5.4$  to  $7.4$ ). For those reducing fat intake, the only difference found was for patients having both a MI and a PTCA ( $n=10$ ), who had reduced their fat intake significantly more than the other subjects ( $n = 52$ ) ( $t = 2.40, MD = -3.10, p < .05$ ,

CI = -5.68 to -0.51). This difference was not due to differences in pre-test scores, as pre-test fat intake was not significantly different between these patients and the other patients who had reduced their fat intake.

Simultaneous multiple regression analysis on subjects who reduced their fat intake showed that a higher pre-test fat intake and a greater improvement in knowledge score were strongly and significantly associated with a greater reduction in fat intake ( $F(2,59) = 14.33, p < .001, \text{adjusted } R^2 = 0.30$ ), accounting for 30% of the variance in fat intake reduction (see Table 29).

**Table 29**

**Multiple Regression Analysis of Factors associated with Reduction in Fat Intake in Cardiac Rehabilitation Participants (n = 61)**

Independent Variable	Regression Model (adjusted $R^2 = 0.30$ )		
	B	SE	Beta
Intercept	0.007	1.30	
Change in knowledge score	-0.22	0.10	-0.24*
Pre-test fat intake score	-0.30	0.07	-0.50***

\*  $p < .05$  (2-tailed) \*\* $p < .01$  (2-tailed) \*\*\* $p < .001$  (2-tailed) B, unstandardised coefficients; SE, standard error; Beta, standardised coefficients; PTCA, percutaneous transluminal coronary angioplasty

As change in knowledge was associated with change in fat intake, the other variables associated with change in knowledge were investigated in those who had reduced their fat intake ( $n = 62$ ). A change in knowledge was strongly and significantly associated with pre-test knowledge (Pearson's  $r = -0.72, p < .01$ ), the negative value indicating that lower pre-test knowledge scores were associated with improved scores at post-test. No other variables were significantly associated.

## **Discussion**

There were small differences between NE groups for numbers of people employed, being accompanied and having had a MI, and moderate differences in age and the number of people who were PTCA patients. However, these differences did not confound the results and the groups could be considered basically similar for comparison purposes.

### **NE in the Experimental Groups**

In both experimental groups, NE was delivered by dietitians and was based on a didactic education mode of dissemination of information and the teaching of skills, as is common in NE (Contento et al., 1995). This knowledge-based approach is believed to be effective only if learners are self-selected and motivated (Contento et al., 1995), which would be likely to apply to CR participants as attendance is ultimately a matter of personal choice. Knowledge-based education has been shown to be associated with healthy eating behaviour in a meta-analysis of the effectiveness of NE (Johnson & Johnson, 1985). However, behavioural education that may have more impact on attitude has been found to be more effective in encouraging dietary change (Contento et al., 1995; Travers, Tan, MacCleave, Murphy, & Whiting, 1992). In people who have already made dietary changes, knowledge-based education may be more important as it provides information necessary for the process of selecting healthier foods (Kristal, Bowen, Curry, Shattuck, & Henry, 1990). However, in spite of conflicting research, the knowledge, attitude and behaviour model of NE is well-accepted and strongly supported by educational theory (Johnson & Johnson, 1985) but, in this study, there was no evidence that it formed the basis for NE in either experimental group.

### **Dietary Fat Knowledge Change**

All groups improved in dietary fat knowledge, regardless of having none or differing amounts of NE, although increases were greatest in the group having the most NE. Knowledge scores for all groups were relatively low, suggesting scope for improvement. Part of the increase may have been due to habituation to the questionnaire, a possible factor in the comparison and one-hour NE group, as the questionnaire was delivered at two-week intervals, but less likely in the 4½-hour NE group that showed the most improvement, as the questionnaire delivery interval was six weeks, making recall of questions less likely. Nutrition information is discussed informally during the program and venues have nutrition displays, posters and handout material available. The initial questionnaire may have stimulated participants in all groups to access more nutritional information, to read handouts and food labels and ask questions of CR staff.

The greater knowledge improvement in the 4½-hour group may be related to the extra NE time, which allowed for a more detailed explanation of the diet, a staged introduction of new concepts and repetition and clarification, which are believed to improve educational outcomes (Lorig, 1996). The additional access to the dietitian during the program may have helped answer questions and clarify misunderstandings.

### **Dietary Attitude Change**

Attitude to healthy eating improved in the 4½-hour group only but attitude was not associated with a reduction in fat intake. Attitude was relatively high pre-NE, leaving little room for improvement in this parameter. Attitude was not specifically targeted by NE and may not be as important in fat reduction because the positive influences of group participation and the strong motivation of life-

threatening illness may override any attitude barriers. The lack of attitude change in the other groups may also be due to the fact that attitudes were generally positive at pre-test or may be a reflection of the shorter interval between questionnaires. A longer intervention period may be necessary for change in this parameter. However, deficiencies in the internal consistency of the attitude questionnaire (as discussed in Part 2 Results, Chapter 5, pp. 167) mean that the results may be unreliable.

Attitude items that had high numbers of positive scores on pre-test would not be expected to improve greatly. In the 4½-hour group, the statements that had relatively low levels of pre-test positive responses were item 9, about new diets being easier to start than keep up, and item 10, about low-fat milk tasting better than full-cream milk, but only item 10 failed to improve at post-test. Another study has shown that patients with CHD have difficulty with the use of low-fat milks (Castelein & Kerr, 1995). Nutrition educators may need to discuss the issue of low-fat milk, if it is found to be an important barrier to compliance with low-fat diets, and use educational strategies aimed at increasing confidence in long-term dietary compliance, as recommended for CR education (Australian Cardiac Rehabilitation Association, 1999; Miller & Taylor, 1995).

### **Dietary Fat Intake Change**

Fat intake reduction could be expected to occur soon after NE, as motivation would be likely to be highest at this time. The initial phase of dietary change has been characterised as the “immersion phase” in which participants suspend their previous dietary habits, make wide-spread changes and adhere fully to guidelines, moving into a transition phase at about three months in which adherence tends to deteriorate (Falk, Bisogni, & Sobal, 2000).

In all groups, participants mean baseline fat intakes were significantly lower than those of an Australian community survey. At post-test, the 4½-hour NE group had the greatest reduction in fat intake, the comparison group had a small reduction and the one-hour group had no reduction. Change in fat intake was not significantly different between the comparison and 1-hour groups. Most participants were already following a relatively low-fat diet and large reductions would not be expected. In the comparison group, the questionnaire or informal NE occurring within the program may have acted as a stimulus to change. However, in the 1-hour group, these factors and the NE session were ineffective.

Although the one-hour group was significantly older, age was not found to be a confounder and no sociodemographic or other differences were associated with the lack of difference in intake in this group. One hour of NE appears insufficient to stimulate further dietary improvement, possibly due to time limitations and the lack of use of effective behaviour change strategies. It is also possible that participants received an overload of information, causing confusion and a feeling of being overwhelmed and consequent uncertainty about making further dietary changes.

In the 4½-hour group, the weekly NE sessions would allow for additional information delivery and for problem-solving, repetition, reinforcement and practice of dietary behaviours, as recommended (Girdano & Dusek, 1988). NE is more effective when tailored to individual needs (Contento et al., 1995) and additional, more specific advice given by the dietitian at one of the twice-weekly exercise sessions may have facilitated change.

In those who had reduced their fat intake, patients having both a MI and a PTCA had greater reductions. The reasons for this are unclear but the motivating

factor of heart disease and surgery has been discussed in Chapter 5, Part 2 (p. 169). As a PTCA procedure is more minor than a CABG, these patients may consider that their disease is more manageable by dietary means.

The questionnaire indicated that the main high-fat foods eaten by participants pre-NE were cheese and pastries, cakes, sweet biscuits or croissants. Post-NE, participants had reduced their high-fat cheese intake but not their intake of pastries, cakes, sweet biscuits or croissants. The knowledge questionnaire responses for Part 2 of this evaluation (Chapter 5, p. 151) showed higher awareness of the fat content of meat products and it may be that sweet snack foods are not perceived as containing fat. Alternatively, these may be favourite foods that most participants find hardest to reduce. It would be useful for nutrition educators to identify such “problem” foods and to discuss healthier alternatives.

#### **Factors associated with Fat Intake Change**

Investigation of patients in the 4½-hour group who had reduced their fat intake showed that a higher baseline fat intake and increased dietary fat knowledge were associated with fat intake reduction. It might be expected that those with the highest fat intakes initially would show the greatest reduction and knowledge was relatively low pre-NE, allowing more room for improvement. Although a causal relationship between knowledge and intake has not been established, knowledge of the types of fat in foods and their effect on CHD would be important in the process of selecting appropriate foods, especially as the public’s knowledge of dietary fat is poor (Buttriss, 1997) and it has been shown that people have difficulty identifying food sources of saturated fat and PUFA accurately (Paisley, Lloyd, Sparks, & Mela, 1995). Knowledge-based NE is

known to be effective in participants who are self-selected and motivated, such as CR participants, as has been discussed previously in this section (p. 187).

Overall, the 4½-hour NE group had the greatest improvement in dietary fat knowledge, healthy eating attitude and fat intake. It appears that NE in this program was effective, in spite of the lack of a behavioural model or specific strategies recommended for adult education. The program elements most responsible for the beneficial effect are yet to be determined but the outcome could be related to the extra amount of NE time, the educational skills of the nutrition educator and/or the opportunity provided for additional individual advice. Other factors may be responsible but an investigation of these was beyond the scope of this evaluation. These include peer group support, social interaction, emotional support and pleasant, encouraging staff, which have been found to be important to patients in other studies (Moore, 1996; Castelein & Kerr, 1995). The strength of the physician's recommendation is an important factor in patients attending CR (Ades et al., 1992b; Ades et al., 1992c) and this may also influence compliance.

### **Hypothesis**

On the basis of this trial, the hypothesis that CR participants exposed to more NE have greater improvements in nutrition knowledge, attitude and habits in the short-term than those exposed to lesser amounts of NE or no NE is supported.



## CHAPTER 7

### **Part 4 Results and Discussion: A Process Evaluation of Outpatient Cardiac Rehabilitation Participants' Satisfaction with Nutrition Education.**

#### **Results**

Participants from seven CR programs ( $n = 260$ ) with varying amounts of NE were surveyed by questionnaire on their satisfaction with the NE session(s) they had attended. Three community health centre ( $n = 87$ ) and four hospital programs ( $n = 173$ ) were surveyed in Melbourne, Victoria, with about half (47%) surveyed after one NE session of approximately one hour, 21% after two sessions (approximately two hours in total) and 32% after six or more sessions (approximately four and a half hours in total).

Participants were patients with CHD (86%), spouses or partners of patients (12%) and relatives or friends (2%) and 69% were male. Age ranged from 36 to 82 years (mean 64, SD 10).

NE topics covered during this survey were dietary fats, food labels and recipe modification. Twenty-six percent of participants were surveyed after a food label and shopping session only, 31% after a dietary fat and recipe modification session only and 43% after sessions including dietary fat, food labels and recipe modification.

#### **Participants' Responses**

Responses to eleven satisfaction statements are shown in Table 30. Total satisfaction scores (sum of items 1 to 10) ranged from 30 to 50 (mean 41.41, SD 4.19). Cronbach's alpha was 0.77, showing that the scale had a slightly lower internal consistency than desirable, and mean inter-item correlations were 0.30.

Over 90% of participants gave positive responses to eight of the

statements. Statements with 10% or more negative responses were negatively-phrased statements 6, 7 and 10 (20%, 10% and 11% negative responses, respectively). Ninety-eight percent of participants indicated that they were satisfied overall with the session (item 13).

**Table 30**  
**Cardiac Rehabilitation Participants' Responses to Statements about Satisfaction with Nutrition Education**

Statement	Strongly agree/ agree (%)	Undecided (%)	Disagree/ strongly disagree (%)
1. The material presented was relevant to my needs	97	2	1
2. I understood the material presented in the session	95	4	1
3. The foods I need to eat and those I need to avoid were clearly explained	98	2	0
4. Questions from the group were answered satisfactorily	99	1	0
5. I was interested in everything covered in the session	95	4	1
6. There was too much information to take in	20	7	73
7. The way the material was presented made it difficult to follow	10	4	86
8. The session gave me good ideas about how to alter my diet	95	3	2
9. The session gave me more confidence to change my diet	93	4	3
10. I am confused about what foods to eat	11	9	80
13. Overall, I was satisfied with the session	98	1	1

Most respondents (70%) would have liked more information on at least one topic (see Table 31). Most requested topics for more information were recipes, eating out and weight loss, followed by cholesterol, types of fat in foods, low-fat foods, food labels, take-away foods, salt, sugar, alcohol and fibre. Other less common suggestions were information on diabetic foods, amount of food to eat, diet for other family members and diet for high blood pressure.

Over half of the participants found the lecture material most helpful (59%), followed by overhead transparencies (45%), group discussion (39%), written handouts (41%), food product displays (36%), videos (30%), nutrition quizzes (23%), posters or charts (11%) and food tastings (0.4%).

**Table 31**  
Topics about which Cardiac Rehabilitation Participants would like More Information (Percent of all Respondents)

Topic	%	Topic	%
Recipes	21	Sugar	10
Eating out	20	Alcohol	7
Weight loss	19	Fibre	6
Types of fat in foods	15	Diabetic foods	0.9
Cholesterol	14	Food quantity	0.3
Low-fat foods	12	Fats in meat	0.3
Food labels	12	Diet for other family members	0.3
Take-away foods	12	Diet for high blood pressure	0.3
Salt	10		

Only thirty-nine participants (15%) gave any suggestions on ways in which the NE session(s) could have been improved. Of those, the most common suggestion was for more recipes (16% of those making suggestions). Other suggestions were for improved educational techniques, which included clearer overhead transparencies (1.5%), more use of visual media, (1.2%), cooking demonstrations or tastings and written handouts (1.1% each), more NE time (1%), more specific, individual advice, use of questionnaires to identify gaps in knowledge, videos that work and foreign language handouts (0.8% each), more group discussions and more varied educational strategies (0.4% each). Other general suggestions were for follow-up sessions, more information on restaurant food (0.8% each), having doctors participate in the sessions, more advice for diabetics and improving the climate control in the room (0.4% each).

### **Factors affecting Participant Satisfaction**

Total satisfaction score (sum of items 1-10) and overall satisfaction (item 13 responses) were significantly, moderately and positively correlated ( $r = 0.43$ ,  $p < .001$ ), indicating that there was reasonable concordance between the two measures. The correlation remained significant and of similar strength when controlling for age.

Age was weakly and negatively correlated with total satisfaction score ( $r = -0.25$ ,  $p < .001$ ), indicating that older participants were less satisfied. Age was not significantly correlated with question 13 on overall satisfaction. Small negative correlations were found between age and statement 1 ( $r = -0.13$ ,  $p < .05$ ), statement 2 ( $r = -0.13$ ,  $p < .05$ ), statement 3 ( $r = -0.18$ ,  $p < .01$ ), statement 4 ( $r = -0.17$ ,  $p < .01$ ), statement 6 ( $r = -0.16$ ,  $p < .01$ ), statement 7 ( $r = -0.16$ ,  $p < .05$ ), statement 8 ( $r = -0.15$ ,  $p < .05$ ) and statement 10 ( $r = -0.20$ ,  $p < .01$ ). This showed that older participants were less satisfied with the relevance of the material, handling of questions, amount of information given, style of presentation and ideas given for dietary change and showed more confusion about what to eat. The amount of exposure to NE was not significantly correlated with individual statement scores or total satisfaction score but was weakly correlated with overall satisfaction ( $r = 0.13$ ,  $p < .05$ ), indicating that more NE exposure was associated with greater overall satisfaction.

Age was divided into four roughly equal ranks: 36 to 55 years ( $n = 68$ ), 56 to 65 years ( $n = 68$ ), 66 to 73 years ( $n = 64$ ) and 74 to 82 years ( $n = 59$ ). Significant moderate differences were found between age ranks ( $F(3,255) = 5.34$ ,  $p < .01$ , partial  $\eta^2 = 0.06$ ). The youngest age group (36 to 55 years) had a significantly higher total satisfaction score than the oldest group (74 to 82 years)

(MD = 2.85,  $p < .001$ ) but there were no significant differences between other age ranks.

There were small, significant differences in total satisfaction score between different CR programs ( $F(6,253) = 3.25$ ,  $p < .01$ , partial eta squared = 0.07), with participants at a community health centre program less satisfied than participants of four other centres. Participants at this centre were significantly older than those of the other centres ( $F(6,253) = 5.13$ ,  $p < .001$ , partial eta squared = 0.11) but controlling for age made no difference to the result.

No significant difference in total satisfaction scores was found between males and females, patients with CHD and their companions or those exposed to differing NE amounts or topics and controlling for age did not affect results.

## Discussion

### Level of Satisfaction

There is a limited amount of published information on satisfaction with NE, but surveys of CR participants have found that NE is regarded as an important program element (Filip, McGillen, & Mosca, 1999; Ruppert, 1993), although difficulties have been experienced with dietary compliance (Castelein & Kerr, 1995). Most participants in this study showed a high level of satisfaction with NE (as shown by responses to item 13 about overall satisfaction) and felt that the material was relevant, understandable, clearly explained, interesting, provided good ideas on dietary modification and questions were adequately addressed.

The satisfaction items 1 to 10 that were added to create the total satisfaction score were found to have a slightly lower internal consistency than desirable but there was reasonable concordance between this score and item 13, which helps to support the validity of the scale. However, the results may need to be interpreted cautiously.

The negatively-phrased items in the scale had the most negative responses and it could be suggested that this may have been due in part to confusion caused by the phrasing. If so, this confusion would be expected to be highest for the first negatively-phrased statement (statement 6), which did have more negative responses than any other question. It is, therefore, difficult to be sure of the interpretation of the results. If the statement's responses were accurate, some participants felt that there was too much information in the NE session to absorb effectively. If too much information was presented, this would explain the confusion about what foods to eat expressed by some participants (statement 10)

and the difficulty following the presentation (statement 7). Undecided responses were also high for statement 6 and 10 and this response was less likely to be misinterpreted, reinforcing the view that responses were genuine. As almost all were satisfied overall with NE, it seems that areas of dissatisfaction were minor.

Although age was not a significant factor in overall satisfaction (item 13), the oldest group of patients had a lower total satisfaction score than the youngest group and age was associated with less positive responses in many individual items. Older patients may not see the relevance of the information as they may not believe that diet is a cause of heart disease or that dietary change will make a difference. They are also less likely to be aware of the current dietary recommendations and research in this area.

#### **Additional Information Requested**

Recipes, eating out and weight loss were the most common topics for which more information was requested; however, less than a quarter of participants suggested these. Modification of recipes is a key method of reducing fat intake and this may need to be addressed individually, as favourite recipes would vary widely. However, general guidelines for low-fat substitute ingredients could be discussed or, alternatively, written recipe handouts could be provided. Handouts may be a better solution, as many older male participants would not be responsible for food preparation in their household and may not understand the ingredients. As many are not accompanied by their partners, recipe handouts would assist the absent partner in planning healthy meals. Appropriate menu choices for eating away from home would also need to be discussed, although, older, unemployed participants may have the majority of their meals at home.

Weight loss is an important factor affecting CHD risk, but it would be

difficult to address this satisfactorily in one or two short sessions. It is often refractory to treatment and long-term success is poor. Additional specific weight loss sessions, incorporating lifestyle modification as well as dietary advice, could be useful.

Information requested on cholesterol, types of fat in food and food labels may reflect the fact that some participants were surveyed after one of the two NE sessions offered, which may not have covered that particular topic. If the information was covered, it may have been presented poorly, leading to requests for more clarification.

### **Helpful Components**

The lecture material was found most helpful, which supports other research findings (Merritt, 1991) but may have been due to the fact that all sessions were primarily lecture-based. If written information was provided in advance, patients could become involved in more group discussion and may find this even more useful. Visual presentations were well regarded, again supporting the findings of other research (Merritt, 1991) but these were limited in most programs to overhead transparencies, static food product displays and videos. A more interactive presentation using food models and quizzes to stimulate discussion may provide more effective education.

### **Suggestions for Improvements**

Few participants made suggestions for improving NE but most comments given reinforced the questionnaire findings that more recipes were desired. Several participants suggested improvements to educational strategies, including more visual media and interactive techniques. Very few commented on wanting more NE time. This may indicate that much of the information is already covered



adequately or is already known. Alternatively, if the material is presented poorly, this may discourage patients from wanting more. It is difficult to draw conclusions about this, as explanations for the response to this question were not specifically addressed.

### **Effect of NE Time on Satisfaction**

More NE exposure was weakly associated with the response to item 13 about overall satisfaction, but not with total satisfaction score. There was a lower total satisfaction score in one health centre program offering one 1-hour NE session in an eight-week program. In this program, NE took the form of an informal round-table talk, as outlined in Part 3 Results (Chapter 6, p. 173) in the description of the experimental community health centre 1-hour group. There would be pressure to cover a large amount of information in the sole NE session and this may have caused the delivery to be too intensive, causing confusion. Alternatively, discussion could have developed that side-tracked the core content and the main issues of interest may not have been covered. Few visual aids were used and this could also be a cause of less satisfaction. Participants in this program were significantly older, but controlling for age did not alter the results and no other contributing factors could be identified. It may be that a combination of factors was responsible, but it seems that one session in eight weeks is likely to be particularly inadequate for an older population.

### **Hypothesis**

The hypothesis that participants' satisfaction with NE is greater in those exposed to more NE time was supported in terms of responses to the overall satisfaction questionnaire item (item 13) but not for the total satisfaction score and the evidence is weak.

## CHAPTER 8

### **Part 5 Results and Discussion: An Outcome Evaluation of Nutrition Education in Outpatient Cardiac Rehabilitation Programs.**

#### **Results**

The follow-up data were collected by an associate researcher, as described in the Methods section, Chapter 3 (p. 122). Seventy-one CR program participants previously surveyed in the quasi-experimental program trial described in Chapter 4 and who had agreed to be followed-up were contacted approximately one year after exiting the CR program. Nine participants did not wish to be interviewed, nine were unable to be contacted, five were unwell, two were absent at the interview time and two were deceased. The remaining subjects (n = 44) participated in the follow-up study, nineteen (43%) of whom had attended a hospital CR program and twenty-five (57%) of whom had attended a community health centre program in Melbourne, Victoria. The type of NE in these programs has been described previously (pp. 173-174).

Subjects had previously completed a pre- and post-NE questionnaire on dietary fat knowledge, healthy eating attitude and fat intake while attending the program and, at follow-up, completed the post-NE questionnaire again, with an additional food frequency and follow-up questionnaire.

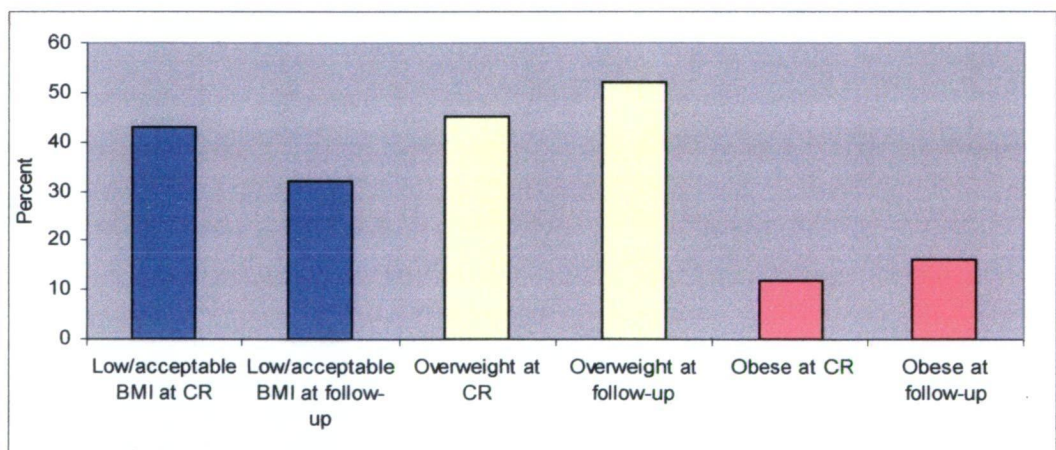
#### **Sociodemographic Characteristics of CR Participants at Follow-up**

Most participants were male (73%), living with others (89%) and preferred to speak English at home (98%). Age ranged from 49 to 88 years (mean 71, SD 8.74) with about three-quarters (76%) aged 65 years or more. Forty-five percent of subjects had been educated to secondary level, 41% to tertiary and 14% to primary level only. Over half (57%) were CABG patients, 34% were MI

and 11% were PTCA patients.

Twenty-three percent had suffered additional heart complications since CR, 25% had required further medical intervention and 9% had attended an additional CR program. About two-thirds (68%) claimed to have continued exercising as recommended by the CR program. Almost all (93%) rated the CR program as helpful or very helpful, the remaining seven percent rating it as somewhat helpful. No relationship was found between those discontinuing exercise and additional heart complications or medical intervention required.

BMI at the CR program ranged from 16 to 36 (mean 25.9, SD 3.9), with 43% having a low/acceptable BMI (<25), 45% overweight (BMI 25 - 29) and 12% obese (BMI  $\geq$ 30) (see Figure 14). Mean BMI for men was 26.2 (SD 4.2) and 25.1 (SD 3.1) for women. Forty-three percent of the men were overweight and 17% were obese. Half the women were overweight and none were obese.



BMI, body mass index; CR, cardiac rehabilitation

**Figure 14.** Percent of cardiac rehabilitation participants who were of low or acceptable weight (BMI <25), overweight (BMI 25-29) and obese (BMI  $\geq$ 30) at cardiac rehabilitation and at follow-up.

At follow-up, BMI ranged from 16 to 36 (mean 26.6, SD 4.0), with 32% having a low/acceptable BMI, 52% overweight and 16% obese. Mean BMI was

in the overweight range for men (mean 26.9, SD 4.3) and women (mean 25.8, SD 2.7). Sixty-nine percent of men were above the acceptable weight range, with nearly half the men overweight (47%) and 22% obese. Sixty-seven percent of women were overweight but none were obese. There was a significant increase in mean BMI (MD 0.7, SD 2.0) for the whole group at follow-up ( $t = 2.25, p < .05, CI 0.07$  to  $1.30$ ) but no significant differences in increases in BMI between men and women.

Twenty-seven subjects (61%) had a significant increase in BMI at follow-up ( $t = 6.92, p < .001, CI -2.16$  to  $-1.17$ ). Increases ranged from 0.1 to 4.5, (mean 1.7, SD 1.3). Sixty-three percent of men had increases in their BMI (mean 1.8, SD 1.2) and fifty-eight percent of women (mean 1.4, SD 1.6). Fifty-two percent of those with an increase in BMI were in the low/acceptable BMI range at CR, 41% were in the overweight group and 7% were in the obese group and the increases were significant in each BMI group ( $t = 5.10, p < .001, CI 1.16$  to  $2.87$ ;  $t = 4.74, p < .01, CI 0.58$  to  $1.60$ ;  $t = 19.68, p < .05, 0.84$  to  $3.90$ , respectively). No associations were found between follow-up BMI and gender, exercise, additional heart complications or medical intervention.

Fifteen subjects (34%) had a reduction in BMI at follow-up (mean reduction 1.1, SD 1.8), 31% of men (mean 1.4, SD 2.2) and 42% of women (mean 0.4, SD 0.3). Reductions ranged from 0.01 to 7.5 and this was also significant ( $t = 2.29, p < .05, CI -0.07$  to  $-2.08$ ). Twenty-seven percent of those with a reduction in BMI were in the low/acceptable BMI range at CR, 53% were in the overweight group and 20% were in the obese group. Reductions were significant in the overweight and obese group ( $t = 3.31, p < .05, CI 0.13$  to  $0.77$ ;  $t = 4.78, p < .05, CI 0.12$  to  $2.22$ , respectively) but not in the low/acceptable group.

**CR Participants' Dietary Fat Knowledge, Attitude to Healthy Eating and Fat Intake Pre- and Post-NE and at Follow-up**

Scores are shown in Table 32. The only significant difference across the three time periods was for knowledge ( $F(2,41) = 4.60, p < .05$ , partial eta squared = 0.10), indicating that 10% of the variance was accounted for by test time. The difference was between pre- and post-NE knowledge scores, which showed a small, significant increase ( $MD = 1.77, t = 3.10, p < .01, CI -2.92$  to  $-0.62$ ).

**Table 32**  
**Cardiac Rehabilitation Subjects' Scores for Dietary Fat Knowledge, Healthy Eating Attitude and Fat Intake Pre- and Post-nutrition Education and at Follow-up**

	<b>Pre-NE (N=43)</b>	<b>Post-NE (N=40)</b>	<b>Follow-up (N=44)</b>
<b>Dietary fat knowledge</b>			
Mean	11.41**	13.09**	12.50
SD	4.33	3.58	3.67
Range	0 - 18	5 - 20	4 - 20
<b>Healthy eating attitude</b>			
Mean	37.14	37.10	38.57
SD	4.61	4.27	4.49
Range	27 - 46	27 - 45	29 - 48
<b>Fat intake</b>			
Mean	16.59	15.32	16.36
SD	8.22	7.30	7.31
Range	3 - 35	3 - 33	4 - 32

\*\* $p < .01$  (two-tailed) NE, nutrition education; SD, standard deviation

Knowledge and fat intake were significantly associated at pre- and post-NE testing ( $r = -0.35, p < .05$  and  $r = -0.43, p < .01$ , respectively). Attitude and intake were also significantly associated at pre- and post-NE testing ( $r = -0.47, p < .01$  and  $r = -0.53, p < .001$ , respectively) but no relationships were found between follow-up scores.

Stage of change was found to be have a moderate, positive association with amount of education ( $r = 0.33, p < .05$ ) and attitude score ( $r = 0.39, p < .01$ ) and a moderate, negative association with fat intake score ( $r = -0.46, p < .01$ ) and

BMI ( $r = -0.32, p < .05$ ), showing that those who claimed to be at a more advanced stage of dietary fat change had a higher level of education, better attitude, a lower fat intake score and a lower BMI.

### **CR Participants' Mean Pre-NE Fat Intake compared to an Australian**

#### **Community Survey**

The CR participants' mean pre-NE, post-NE and follow-up fat intake scores were found to be significantly lower than those of an Australian community survey (see Table 33).

**Table 33**

**Cardiac Rehabilitation Participants' Pre-nutrition Education Fat Intake Mean Score compared to those of an Australian Community Survey<sup>1</sup>**

Group	No. of subjects	Mean scores	SD	t	CI	
					Lower	Upper
<b>Whole group</b>						
Community survey	328	23.49	7.57			
CR participants pre-NE	44	16.59	8.22	5.56***	-9.40	-4.40
CR participants post-NE	44	15.32	7.30	7.42***	-10.39	-5.95
CR participants follow-up	44	16.36	7.31	6.46***	-9.35	-4.90
<b>Age 56 years or more</b>						
Community survey	94	20.39	8.43			
CR participants pre-NE	40	16.88	8.24	2.70*	-6.15	-0.88
CR participants post-NE	40	15.53	7.33	4.20***	-7.21	-2.52
CR participants follow-up	40	16.40	7.14	3.54**	-6.27	-1.71

\* $p < .05$  (2-tailed) \*\* $p < .01$  (2-tailed) \*\*\* $p < .001$  (2-tailed)

<sup>1</sup>Dobson A, Blijlevens R, Alexander H, Croce N, Heller R, Higginbotham N, Pike G, Plotnikoff R, Russell R, Walker R. Short fat questionnaire: a self-administered measure of fat-intake behaviour. *Aust J Pub Health*. 1993;17:144-149

NE, nutrition education; CR, cardiac rehabilitation; SD, standard deviation; CI, confidence interval

### **CR Participants' Nutrient Intake at Follow-up**

CR participants' follow-up food frequency questionnaire responses for all subjects are shown in Table 34 and for men and women in Table 35.

CR participants' mean intakes for the whole group were compared to recommended amounts for prevention of heart disease. Intakes of total fat (g),

saturated fat (g), fat (% energy), monounsaturated fat (% energy), cholesterol and alcohol were consistent with recommendations.

Mean saturated fat as a percent of energy was slightly higher than the latest Australian recommendation of no more than eight percent for patients with CHD (National Heart Foundation of Australia, 1999). PUFA as a percent of energy and PS ratio was lower than recommended. Mean energy intake was lower than the recommended ranges for men and higher than that recommended for women (International Task Force for Prevention of Coronary Heart Disease, 1999). Carbohydrate was slightly lower than the recommended level of more than 50% and sugar comprised 21% of energy. Although there are no specific recommendations for sugar intake, patients with CHD are advised to reduce sugar, especially in those with elevated serum triacylglycerols (International Task Force for Prevention of Coronary Heart Disease, 1999).

For men, mean saturated fat (% of energy) was higher and mean carbohydrate and PUFA (% of energy) was lower than recommended and sugar comprised 19% of energy. For women, mean energy was lower than recommended, mean saturated fat (% of energy) was higher and PUFA (% of energy) was lower. Carbohydrate as a percent of energy was acceptable but sugar was 26% and dietary fibre borderline with the recommended amount.

**Table 34**  
**Cardiac Rehabilitation Subjects' Mean Nutrient Intake at Follow-up and Mean Intake of 1995 National Nutrition Survey<sup>1</sup> Subjects 65 Years or More compared to Recommended Amounts**

Intake	CR subjects (n=44) Mean ±SD	NNS subjects 65+ (n=1960) Mean	Recommended
Energy (kJ)	7290 ±2139	7439	7900-9000 <sup>a</sup> (men 65+) 6900-7000 <sup>a</sup> (women 54+)
Total fat (g)	58 ±23	65	-
SFA (g)	20 ±10	23	-
MUFA (g)	21 ±10	24	-
PUFA (g)	11 ±5	10	-
PUFA:SFA	0.59 ±0.27	0.40	-
Fat (% kJ)	29 ±6	32	<30 <sup>b</sup>
SFA (% kJ)	10 ±3	12	≤8 <sup>c</sup>
MUFA (% kJ)	10 ±3	11	10-15 <sup>b</sup>
PUFA (% kJ)	6 ±2	5	8-10 <sup>c</sup>
Protein (% kJ)	18 ±3	17	-
Carbohydrate (% kJ)	47 ±6	47	>50 <sup>b</sup>
Sugar (% kJ)	21 ±6	21	-
Cholesterol (mg)	140 ±60	240	<300 <sup>b</sup>
Dietary fibre (g)	27 ±8	22	>25 <sup>b</sup>
Alcohol (g)	11 ±14	10	≤10 (women) <sup>d</sup> ≤20 (men) <sup>d</sup>

<sup>1</sup> Australian Bureau of Statistics. *National nutrition survey: foods eaten 1995*. Canberra: ABS; 1997.

<sup>a</sup> English, R & Lewis, J. *Food for Health*. Canberra: National Food Authority; 1991.

<sup>b</sup> International Task Force for Prevention of Coronary Heart Disease. Coronary Heart Disease: Reducing the Risk. *Arterioscler Thromb Vasc Biol*. 1999;19(8):1819-1824.

<sup>c</sup> National Heart Foundation of Australia. A review of the relationship between dietary fat and cardiovascular disease. *Aust J Nutr Diet*. 1999;56:S3-S4.

<sup>d</sup> Krauss R, Eckel R, Howard B, et al. AHA Dietary Guidelines; Revision 2000: a statement for healthcare professionals from the Nutrition Committee of the American Heart Association. *Circulation*. 2000;102:2296-2311.

CR, cardiac rehabilitation; NNS, National Nutrition Survey, SD, standard deviation; SFA, saturated fat; MUFA, monounsaturated fat; PUFA, polyunsaturated fat



**Table 35**

**Mean Nutrient Intake for Cardiac Rehabilitation Men and Women at Follow-up and Mean Intake of 1995 National Nutrition Survey<sup>1</sup> Subjects 65 Years or More compared to Recommended Amounts**

Intake	CR Men (n=32) Mean $\pm$ SD	NNS Men 65+ (n=902) Mean	CR Women (n=12) Mean $\pm$ SD	NNS Women 65+ (n=1058) Mean	Recommended
Energy (kJ)	7727 $\pm$ 2232	8510	6125 $\pm$ 1345	6367	7900-9000 <sup>a</sup> (men 65+) 6900-7000 <sup>a</sup> (women 54+)
Total fat (g)	62 $\pm$ 24	74	46 $\pm$ 19	57	-
SFA (g)	22 $\pm$ 10	28	16 $\pm$ 7	22	-
MUFA (g)	23 $\pm$ 10	27	17 $\pm$ 8	20	-
PUFA (g)	12 $\pm$ 5	12	9 $\pm$ 5	9	-
PUFA:SFA	0.59 $\pm$ 0.28	0.41	0.61 $\pm$ 0.24	0.39	-
Fat (% kJ)	29 $\pm$ 6	32	27 $\pm$ 7	32	<30 <sup>b</sup>
SFA (% kJ)	10 $\pm$ 3	12	9 $\pm$ 3	12	$\leq$ 8 <sup>c</sup>
MUFA (% kJ)	11 $\pm$ 3	12	10 $\pm$ 3	11	10-15 <sup>b</sup>
PUFA (% kJ)	6 $\pm$ 2	5	6 $\pm$ 2	5	8-10 <sup>c</sup>
Protein (% kJ)	17 $\pm$ 2	17	19 $\pm$ 3	18	-
CHO (% kJ)	46 $\pm$ 5	46	51 $\pm$ 6	47	>50 <sup>b</sup>
Sugar (% kJ)	19 $\pm$ 5	21	26 $\pm$ 7	22	-
Cholesterol (mg)	148 $\pm$ 64	273	118 $\pm$ 41	207	<300 <sup>b</sup>
Dietary fibre (g)	27 $\pm$ 8	24	25 $\pm$ 6	20	>25 <sup>b</sup>
Alcohol (g)	14 $\pm$ 15	15	1 $\pm$ 3	5	$\leq$ 10 (women) <sup>d</sup> $\leq$ 20 (men) <sup>d</sup>

<sup>1</sup>Australian Bureau of Statistics. *National nutrition survey: foods eaten 1995*. Canberra: ABS; 1997.

<sup>a</sup>English, R & Lewis, J. *Food for Health*. Canberra: National Food Authority; 1991

<sup>b</sup>Assman G, Cullen P, Jossa F, Lewis B, Mancini M. Coronary heart disease: reducing the risk (International Task Force for Prevention of Coronary Heart Disease). *Arterioscler Thromb Vasc Biol*. 1999;19:1819-1824.

<sup>c</sup>National Heart Foundation of Australia. A review of the relationship between dietary fat and cardiovascular disease. *Aust J Nutr Diet*. 1999;56:S3-S4.

<sup>d</sup>Krauss R, Eckel R, Howard B, et al. AHA Dietary Guidelines; Revision 2000: a statement for healthcare professionals from the Nutrition Committee of the American Heart Association. *Circulation*. 2000;102:2296-2311.

CR, cardiac rehabilitation; NNS, National Nutrition Survey, SD, standard deviation; SFA, saturated fat; MUFA, monounsaturated fat; PUFA, polyunsaturated fat

Male intake was significantly higher in kilojoules, fat and alcohol and significantly lower in carbohydrates and sugar as a percent of energy compared to female intake (see Table 36).

**Table 36**  
**Significant Differences in Cardiac Rehabilitation Subjects' Mean Intakes at Follow-up for Men (n=32) compared to Women (n=12)**

Intake	Mean difference (Men-women)	t	CI	
			Lower	Upper
Energy (kJ)	1601.91	2.32*	210.24	2993.57
Total fat (g)	15.97	2.10*	0.61	31.32
Carbohydrate (% of energy)	-5.29	3.03**	-8.82	-1.77
Total sugar (% of energy)	-5.99	3.36**	-9.59	-2.39
Alcohol (g)	13.09	4.61***	7.33	18.86

\*p<.05 (2-tailed) \*\*p<.01 (2-tailed) \*\*\*p<.001 (2-tailed) CI, confidence interval

**CR Participants' Nutrient Intake at Follow-up compared to the 1995**

**National Nutrition Survey Respondents**

CR subjects' daily intakes derived from the food frequency questionnaire were compared with those obtained from the 1995 National Nutrition Survey (NNS) (Australian Bureau of Statistics, 1997) for all subjects aged 65 years or more and for men and women in the same age group (see Table 37). The NNS was a 24-hour diet recall and, as two different methods are being compared, the results should be interpreted cautiously.

CR subjects had significantly lower intakes of total fat (amount and % of energy), saturated fat (amount and % of energy), MUFA (% of energy) and cholesterol and the PS ratio was significantly higher. For men, intakes of total fat (amount and % of energy), saturated fat (% of energy) and cholesterol were significantly lower and the PS ratio was significantly higher. For women, intakes of fat (% of energy), saturated fat (amount and % of energy) and cholesterol was significantly lower and the PS ratio was significantly higher.

**Table 37**

**Significant Differences in Cardiac Rehabilitation Subjects' Mean Intakes at Follow-up for All Subjects and by Gender compared to 1995 National Nutrition Survey<sup>1</sup> Subjects Aged 65 Years and Over (n = 1960, men = 902, women = 1058)**

Intake	Mean difference	t	CI	
			Lower	Upper
<b>CR participants (n=44)</b>				
Fat % of energy	-3.01	3.19**	-4.91	-1.11
SFA % of energy	-2.01	4.24***	-2.96	-1.05
MUFA % of energy	-1.00	2.41*	-1.84	-0.16
PUFA:SFA	0.19	4.72***	0.11	0.27
Total fat (g)	-7.34	2.08*	-14.44	-0.24
SFA (g)	-3.19	2.24*	-6.07	-0.31
Cholesterol (mg)	-100.17	11.10***	-118.36	-81.97
Fibre (g)	4.68	4.13***	2.39	6.97
<b>CR men (n=32)</b>				
Fat % of energy	-2.82	2.64*	-5.00	-0.64
SFA % of energy	-2.01	4.24***	-2.96	-1.05
PUFA:SFA	0.18	3.53**	0.07	0.28
Total fat (g)	-11.53	2.76*	-20.07	-3.00
Cholesterol (mg)	-125.17	11.04***	-148.28	-102.03
Fibre (g)	3.47	2.48*	0.62	6.32
<b>CR women (n=12)</b>				
Fat % of energy	-5.70	2.89*	-10.04	-1.36
SFA % of energy	-3.02	3.32**	-5.02	-1.01
PUFA:SFA	0.22	3.10*	0.06	0.37
SFA (g)	-6.55	3.29**	-10.93	-2.17
Cholesterol (mg)	-88.78	7.47***	-114.94	-62.62
Fibre (g)	4.38	2.44*	0.43	8.34
Alcohol (g)	-3.35	4.10**	-5.15	-1.55

\*p<.05 (2-tailed) \*\*p<.01 (2-tailed) \*\*\*p<.001 (2-tailed)

<sup>1</sup>Australian Bureau of Statistics, National nutrition survey: foods eaten 1995. Canberra; 1997

SFA, saturated fat; MUFA, monounsaturated fat; PUFA, polyunsaturated fat; CR, cardiac rehabilitation; CI, confidence interval

### **Types of Foods eaten by CR Participants at Follow-up**

Cardiac patients, especially those with hyperlipidaemia, are advised to use low-fat dairy products, MUFA or PUFA margarine and wholemeal or wholegrain breads (International Task Force for Prevention of Coronary Heart Disease, 1999). At follow-up, most CR participants were complying with this advice and used either no milk, skim or reduced fat milk (82%), no cheese or low-fat cheeses (66%), no spread or MUFA or PUFA margarine (86%) and wholemeal or multi-

grain bread (68%) (see Table 38). Male and female intakes of these foods were not significantly different.

**Table 38**  
Type of Milk, Cheese, Spread and Bread Eaten by Cardiac Rehabilitation Subjects at Follow-up

Intake		All CR subjects (N=44) (%)	CR Males (n=32) (%)	CR Females (n=12) (%)
<b>Milk</b>	None	7	9	0
	Skim	39	34	50
	Reduced fat	36	38	33
	Full-cream	16	16	17
	Soy	2	3	0
<b>Cheese</b>	None	14	16	8
	Low-fat	43	38	58
	Ricotta or cottage	9	9	8
	Firm	30	34	17
	Soft	2	3	0
	Cream	2	0	8
	None	18	19	17
<b>Spread</b>	Polyunsaturated margarine	36	34	42
	Monounsaturated margarine	32	34	25
	Any margarine	7	6	8
Butter	Butter	5	3	8
	Butter and margarine blend	2	3	0
<b>Bread</b>	Wholemeal	41	41	42
	Multi-grain	27	22	42
	White	16	19	8
	High-fibre white	9	9	8
	Rye	7	9	0

CR, cardiac rehabilitation

Most CR participants ate foods containing saturated fat less than three times a week (see Table 39). These included dairy products, meat products, eggs and processed foods likely to contain saturated fat as an ingredient. Forty-one percent of subjects ate sweet biscuits and red meat more than twice weekly. About a third ate processed meats (36%) and cheese (34%), about a quarter (23%) ate cakes, sweet pies, tarts and sweet pastries and 18% ate ice-cream more than twice weekly. Significantly more men ate red meat more than twice weekly compared to women (chi square = 4.01,  $p < .05$ , Phi = 0.30), but there were no other significant differences between men and women.

**Table 39**

**Number of Cardiac Rehabilitation Subjects eating Foods containing Saturated Fat more than Twice a Week at Follow-up**

Intake	All CR subjects (%) (n=44)	CR Males (%) (n=32)	CR Females (%) (n=12)
<b>Cereal products</b>			
Sweet biscuits	41	44	33
Cakes, sweet pies, tarts, sweet pastries	23	22	25
Meat pies, pasties, quiche, savoury pastries	2	3	0
<b>Snacks</b>			
Corn chips, potato crisps, Twisties etc.	2	3	0
Potatoes roasted or fried (including hot chips)	2	3	0
Chocolate	9	6	17
<b>Dairy products</b>			
Cheese	34	41	17
Ice-cream	18	22	8
Flavoured milk drinks	5	6	0
<b>Meat products and eggs</b>			
Beef or lamb	41	50*	17*
Processed meats (bacon, ham, sausage meats)	36	34	42
Eggs	4	6	0

\*p<.05 (two-tailed). CR, cardiac rehabilitation

General advice for prevention of heart disease is to increase intake of high-fibre cereals, legumes, nuts, fish, fruit and vegetables and limit alcohol intake (International Task Force for Prevention of Coronary Heart Disease, 1999).

More than half the CR participants were eating high-fibre breakfast cereals daily (57%, median = daily) and more than three-quarters ate fish twice weekly or more (77%, median = twice weekly), at least two pieces of fruit daily (77%, median = 2 daily) and legumes twice weekly or more (93%, median = daily) (see Table 40).

Only 30% ate nuts twice weekly or more (median = 3 times a week) and only 21% ate five or more serves of vegetables daily (median = 4 daily). Thirty-two percent drank alcohol daily. Seventy-nine percent drank only one or two drinks when drinking (median = 1 drink per session). All the women drank a maximum of one drink per session when drinking and 72% of men drank a

maximum of 2 drinks per session when drinking.

**Table 40**

**Cardiac Rehabilitation Subjects' Intake of High-fibre Breakfast Cereals, Legumes, Nuts, Fish, Fruit and Vegetables at Follow-up**

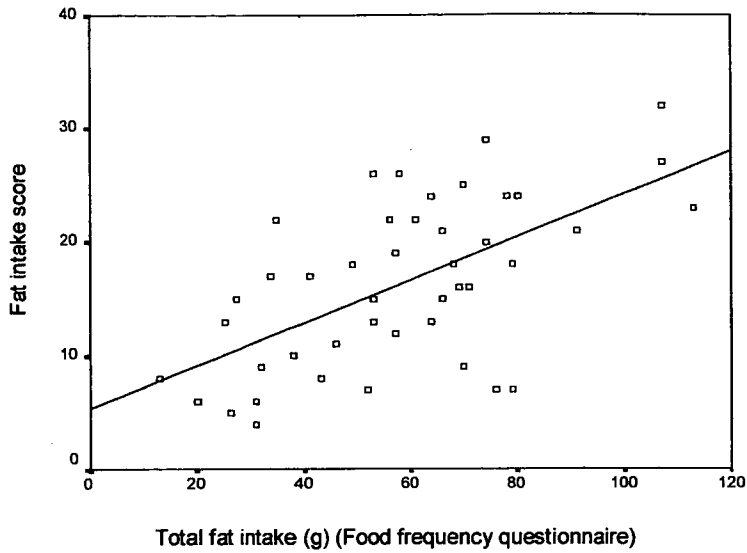
<b>Intake</b>	<b>All CR subjects (%) (n=44)</b>	<b>CR Males (%) (n=32)</b>	<b>CR Females (%) (n=12)</b>
High-fibre breakfast cereals (daily)	57	53	67
Legumes (twice weekly or more)	93	100**	75**
Nuts (twice weekly or more)	30	28	33
Fish (twice weekly or more)	77	72	92
Fruit (2 or more daily)	77	69*	100*
Vegetables (5 or more daily)	21	19	25
Alcohol (daily)	32	41*	8*
Alcohol (1 drink per session)	52	34	100
Alcohol (2 drinks per session)	27	38*	0*

\*p<.05 \*\*p<.01 (for comparison between men and women) CR, cardiac rehabilitation

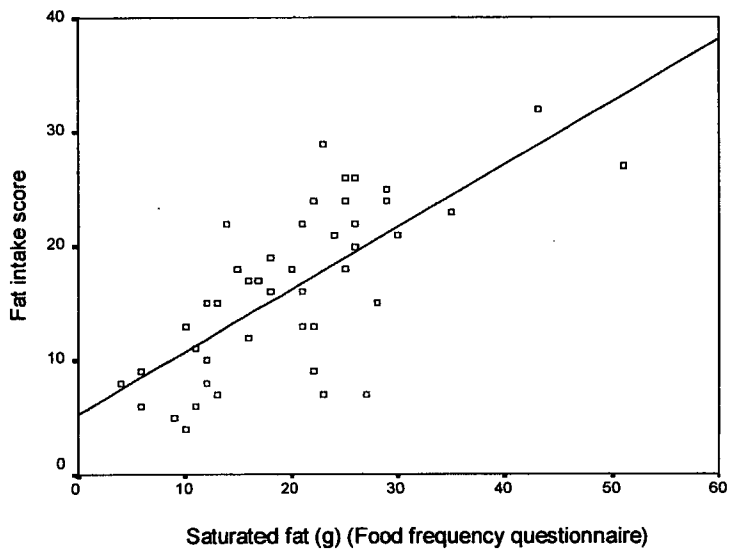
Significantly more men than women ate legumes twice a week or more (chi square = 8.59, p<.01, Phi = 0.44) and significantly more women ate two or more pieces of fruit a day (chi square = 4.85, p<.05, Phi = 0.33). More men drank alcohol daily (chi square = 4.20, p<.05, Phi = 0.31) and men drank significantly more alcohol per session (chi square = 6.19, p<.05, Phi = 0.38). There were no other significant differences between male and female intakes.

**Relationships between Food Intake and Questionnaire Scores**

There were large positive correlations between fat intake score and total fat intake (r = 0.60, p<.001) (see Fig. 15), fat as a percent of energy (r = 0.56, p<.001), saturated fat (r = 0.71, p<.001) (see Fig. 16), saturated fat as a percent of energy (r = 0.69, p<.001) and cholesterol (r = 0.57, p<.001), showing that higher intakes were associated with higher fat intake scores. Medium positive correlations were found between fat intake score and PUFA (r = 0.36, p<.05), MUFA (r = 0.48, p<.01), MUFA as a percent of energy (r = 0.37, p<.05) and energy (r = 0.47, p<.01).



**Figure 15.** Scatterplot of the correlation between total fat intake (g), as assessed by the food frequency questionnaire, and fat intake score.



**Figure 16.** Scatterplot of the correlation between total saturated fat intake (g), as assessed by the food frequency questionnaire, and fat intake score.

The only significant correlation between follow-up knowledge score and nutrient intake was for fat as a percent of energy ( $r = -0.30, p < .05$ ), indicating that a high knowledge score was moderately associated with a lower fat percentage intake. For follow-up attitude score, there was a moderate negative correlation with saturated fat intake ( $r = -0.30, p < .05$ ), indicating that a better attitude was associated with a lower saturated fat intake.

## **Factors associated with Follow-up BMI**

Significant correlations between BMI and other variables are shown in

Table 41.

**Table 41**  
**Pearson Product-moment Correlations for Body Mass Index of Cardiac Rehabilitation Participants (n = 44) at Follow-up**

<b>Variables</b>	<b>Pearson's r</b>
Stage of change	-0.32*
Saturated fat intake	0.30*
Energy	0.33*
Alcohol intake	0.42**
Fat intake questionnaire score	0.42**

\*p<.05 (2-tailed) \*\*p<.01 (2-tailed)

There were significant, moderate associations between a higher BMI at follow-up and a lower stage of change, higher alcohol, energy and saturated fat intake and higher follow-up fat intake questionnaire score.

Subjects who had increased their BMI (n = 27) were investigated to determine the factors associated with this increase. For this group, BMI calculated when attending the CR program was 25.0 (SD 3.5) and mean BMI at follow-up was 26.9 (SD 3.7), a mean increase of 1.67. The majority reported having no additional heart complications since CR (70%), no additional CR attendance (89%), no further medical intervention (70%) and no additional dietary advice (89%). Most said that they had continued the suggested exercise program (74%) and were in the maintenance phase of dietary stage of change (85%).



Strong, positive associations were found for BMI and cholesterol intake ( $r = 0.65, p < .001$ ), saturated fat intake ( $r = 0.55, p < .01$ ) and fat intake questionnaire score ( $r = 0.62, p < .01$ ), indicating a higher intake of saturated fat and cholesterol and higher questionnaire scores in those with greater BMI. A moderate, positive association was found for BMI and alcohol intake ( $r = 0.41, p < .05$ ) and there was a moderate, negative association for sugar as a percent of energy ( $r = -0.45, p < .05$ ), indicating a higher alcohol and lower percentage sugar intake in those with greater BMI. No other macronutrients were significantly associated with BMI.

Subjects who had increased their BMI showed strong and negative associations between BMI at follow-up and stage of change ( $r = -0.62, p < .01$ ), indicating that subjects in this group with higher BMI were more likely to be at a lower dietary stage of change.

Simultaneous multiple regression analysis was used for subjects who had increased their BMI to assess the relationship between BMI and other variables. A higher follow-up fat intake score and not needing further medical help were strongly and significantly associated with follow-up BMI ( $F(2,24) = 11.27, p < .001, \text{adjusted } R^2 = 0.44$ ), accounting for 44% of the variance (see Table 42).

No variables were significantly correlated with reduced BMI ( $n = 15$ ) and no significant differences in sociodemographic characteristics were found between those who had increased and those who had reduced their BMI but the number of subjects may have been too small to detect associations or differences.

**Table 42****Simultaneous Multiple Regression Analysis of Follow-up Body Mass Index in Cardiac Rehabilitation Subjects with Increased Body Mass Index (n = 26)**

<b>Independent Variable</b>	<b>Regression Model</b> (adjusted R <sup>2</sup> = 0.44)		
	<b>B</b>	<b>SE</b>	<b>Beta</b>
Intercept	29.04	2.97	
Further medical help (0=No, 1=Yes)	-2.41	1.09	-0.32*
Follow-up fat intake score	0.18	0.07	0.42**

\*p<.05 (2-tailed) \*\*p<.01 (2-tailed) B, unstandardised coefficients; SE, standard error; Beta, standardised coefficients

## **Discussion**

### **Changes in Dietary Fat Knowledge, Attitudes and Intake**

A limitation of the results is that the data were obtained from self-reported dietary questionnaires. Both questionnaires had been validated but the food frequency questionnaire had not been validated on a CR population. However, correlations between questionnaire scores and food frequency calculations of total fat, saturated fat, PUFA, MUFA and cholesterol intake were significant, providing supporting evidence for the questionnaires' validity. The deficiencies in the fat intake questionnaire have been discussed previously in Part 2 Results, Chapter 5 (pp. 166-167) and, although the questionnaire score also correlated significantly with follow-up BMI, it may need modification to improve its use as a tool for assessing fat intake and dietary improvement.

In this outcome evaluation, NE appeared to have no effect on participants' attitude and fat intake and only a slight effect on knowledge, however, knowledge, attitude and intake remained stable over the twelve months post-CR. The amount of NE most participants had been exposed to was only 1-1½ hours and may have been insufficient in either quantity or quality to generate further changes in participants. Participants were already following low-fat diets and attitudes were positive, so large improvements would not be expected. Knowledge was poor pre-NE and this was the only parameter to improve.

### **Changes in BMI**

The baseline heights and weights were self-reported but are expected to be reasonably accurate as most had been weighed as part of their cardiac assessment and/or were self-monitoring their weight. Subjects were weighed and measured by the researcher at follow-up and, to improve accuracy, the height as measured

at follow-up was used to calculate baseline BMI. Even if participants had been weighed at the CR program, different scales and clothing would have given different results. Accordingly, the BMI calculations should be regarded as estimates and results interpreted cautiously.

More than half of the CR participants appeared to be overweight at the time of CR and two-thirds increased their BMI in the subsequent year, almost half of whom were overweight or obese at CR. This may indicate that NE in the CR program failed to address the issue of overweight as a risk factor for cardiac events or that NE was ineffective in dealing with this issue. For many people, weight loss is extremely difficult and, in spite of the motivation of having heart disease, it seems that patients with CHD continue to gain weight.

Only two-thirds of CR participants reported continuing the recommended exercise regime at one year after leaving the CR program, in spite of all participants claiming that the CR program was helpful. A discussion of the role of exercise in CR is beyond the scope of this thesis, however, there were no relationships detected between reported discontinuation of recommended exercises and an increase in BMI.

A higher follow-up BMI was associated with a higher alcohol, saturated fat and energy intake. Overweight participants may need more education about saturated fat and alcohol reduction and the need to reduce overall energy intake. An increase in BMI at follow-up was associated with a high follow-up fat intake score and not needing further medical help since CR. Patients with CHD whose health stabilises may become complacent and dietary compliance may lapse.

### **CR Participants' Diets at Follow-up compared to Standard Australian Diets**

CR participants were eating a healthier diet at follow-up compared to respondents of similar age in the National Nutrition Survey (Australian Bureau of Statistics, 1997). The CR group had a significantly better intake of dietary fat, cholesterol and fibre. Alcohol is not a common topic in many NE sessions and is regarded as protective against heart disease in moderate quantities (Jackson, Scragg, & Beaglehole, 1991). Participants in this survey appeared to be having moderate amounts only, but this could contribute to excess kilojoule intake and weight gain. It may be necessary to discuss the kilojoule content of alcohol and stress the importance of reducing intake if trying to lose weight, particularly for men, who were shown to have a higher intake than women.

### **CR Participants' Diets at Follow-up compared to Recommendations for Secondary Prevention**

Participants were eating according to recommendations for secondary prevention, except for saturated fat, which was slightly higher, and PUFA and carbohydrates, which were lower, although sugar intake was high. Jam, marmalade, honey, syrups and sweet biscuits were used relatively frequently and it may be that patients with CHD are substituting sugary foods for fatty foods.

Intake of nuts and vegetables was relatively low. Nuts may be seen as high in fat and are therefore avoided, but studies have shown them to have beneficial effects (Hu & Stampfer, 1999) and they should be encouraged in moderate amounts. Vegetables are required for their antioxidant content (Kushi, Lenart, & Willett, 1995) and should be increased in patients with heart disease (Expert Panel on Detection Evaluation and Treatment of High Blood Cholesterol in Adults, 2001).

## **Hypothesis**

The hypothesis that compliance with low-fat diets in CR patients is reduced one year after leaving the CR program is not supported. However, some dietary habits still need improvement in patients with CHD.

## **CHAPTER 9**

### **Concluding Discussion and Recommendations**

#### **Discussion**

Discussions of the research questions relating to each part of this evaluation have been included in the relevant results chapters. Limitations of the research methodology and instruments have been included in the Methods section (Chapter 3). An important limitation is lack of randomisation of subjects and centres in the impact and outcome evaluations (Chapters 6 & 8). Health program evaluation may be limited in many ways, as discussed in Chapter 2, pp. 89-90. This evaluation was limited mainly by inadequate program documentation regarding aims, objectives, content and delivery methods and the differing delivery, contexts and settings in which the programs were carried out. These limitations mean that the results of this evaluation are not necessarily applicable to all CR programs and the recommendations made are therefore tentative until further research is undertaken.

The concluding discussion will be confined to a discussion of the three main hypotheses that formed the basis for this evaluation research. After the concluding discussion of each of these hypotheses, recommendations arising from the findings of all parts of this evaluation are presented, followed by the key recommendations, the overall conclusions and the areas in which further research is required.

**Hypothesis 1: NE is included in all Victorian Outpatient CR Programs and accords with HF Recommendations**

The HF recommends that education, discussion and counselling in outpatient CR programs should include a range of elements, the following of which relate to NE (Baghurst, Baghurst, & Record, 1994):

- risk factors for heart disease and their modification for secondary prevention (e.g. smoking cessation, physical activity, good nutrition, control of blood lipids, weight, blood pressure and diabetes);
- skills for behaviour change and maintenance.

The HF objectives for NE in outpatient CR programs are as follows (National Heart Foundation, 1993, p.4):

1. To determine current knowledge of the link between diet and heart disease;
2. To clarify, reinforce and increase knowledge of this area;
3. To encourage participants to modify their diet;
4. To introduce participants to ways they may modify their diet.

The Part 1 process evaluation (Chapter 4) has shown that NE is offered in all Victorian CR programs but there are a limited number of NE sessions per program (Figure 2, p. 131), the total amount of time allotted to NE is very limited (Figure 4, p. 132) and the Part 2 process evaluation (Chapter 5) has shown that, for most patients, the CR program is their first opportunity to receive nutritional information from a health professional (Table 11, p. 146). NE is delivered in a group setting in all programs and participants are able to ask questions throughout the presentations but true group discussion is limited. Group education is recommended by the HF (National Heart Foundation, 1993) and it is believed to



assist the identification of problems, formulation of solutions and generation of commitment to ongoing dietary compliance (Johnson & Johnson, 1985). The Part 4 process evaluation (Chapter 7) found that CR participants find group discussion helpful but, if opportunities for discussion are limited, participants may not gain the full benefits of group interaction.

The Part 1 process evaluation (Chapter 4) has shown that NE is primarily knowledge-based and didactic. The first two of the HF's objectives for NE are related to increasing knowledge about diet and heart disease and all programs were found to include knowledge-based aims, objectives and content for NE, primarily related to dietary fat (Table 1, p. 133; Table 2, p. 134; Table 3, p. 135). The HF's objectives for patient education, discussion and counselling and the last two objectives for NE relate to skills required for behaviour change and very little evidence was found that NE used aims, objectives, content or delivery directly related to encouraging or enabling participants to modify their diet.

The knowledge-based, lecture-style methods of NE that were found to be common in Victorian outpatient CR programs are not regarded as the most appropriate educational approaches. The conclusion of a meta-analysis of NE is that it should be based on a theoretical model of behaviour change and use adult education and behaviour change strategies to increase effectiveness (Johnson & Johnson, 1985).

The Part 1 process evaluation has shown that NE in most Victorian outpatient CR programs does not appear to have an explicit theoretical foundation, such as the health belief model (Rosenstock, 1974), the TRA model (Ajzen & Fishbein, 1980), the self-efficacy model (Bandura, 1982) or the stage of change model (Prochaska & DiClemente, 1982), a finding also reported by the

Australian Cardiac Rehabilitation Association, 1999). The major advisory bodies for CR programs, such as the National Heart Foundation, the Australian Cardiac Rehabilitation Association, the Heart Research Centre in Victoria and the American Association of Cardiovascular and Pulmonary Rehabilitation, endorse behavioural approaches (National Heart Foundation, 1993; Australian Cardiac Rehabilitation Association, 1999; Goble & Worcester, 1999; Miller & Taylor, 1995). The Australian Cardiac Rehabilitation Association endorses the stage of change and self-efficacy models (Australian Cardiac Rehabilitation Association, 1999) but the other organisations do not specify a particular model. Adult education strategies, such as group education, interactive discussion, individualised approaches and goal setting, are recommended by most organisations but the HF does not recommend specific strategies.

Research to date has not identified the most effective model for CR education and, therefore, it could not be expected that NE would be based on a specific model. In the absence of such a model, NE would be expected to incorporate standard, well-accepted adult education strategies that are designed to impact on attitude and behaviour, as well as knowledge, as recommended for NE (Johnson & Johnson, 1985). However, this evaluation found no evidence that these strategies were incorporated into NE in Victorian outpatient CR programs.

**Hypothesis 2: The Impact of NE and Participant Satisfaction with NE is Greater in Participants Exposed to More NE Time**

In the Part 2 process evaluation, CR participants were found to be mainly older, English-speaking men who had received nutritional information from patient handout material and/or family members (Table 11, p. 146).

Most patients were overweight or obese and, although BMI was calculated from reported heights and weights, which may result in some inaccuracy, values are as expected, given the high prevalence of overweight in the Australian population (Mathur, 2002) and in other overseas CR programs (Bader, Maguire, Spahn, O'Malley, & Balady, 2001; Lavie & Milani, 1996). This is of concern, given the strong link between elevated BMI and CHD (Field et al., 2001). Most programs did not report NE aims, objectives or content relating to weight loss (Table 1, p. 133; Table 2, p. 134; Table 3, p. 135). CR programs do not appear to screen patients for overweight at entry, monitor patients for overweight during the program or offer specific interventions to overweight patients.

The Part 2 process evaluation also found that, prior to NE, CR participants' knowledge of dietary fats was poor but attitude to healthy eating was positive and fat intake relatively low. Knowledge and attitudes were no different from those of a PR group (Table 17, p. 157) but fat intake was lower and also lower than that of an Australian community survey (Table 16, p. 156). Australian studies have shown that a lower than average fat intake is more common in people with a history of CVD and CHD (Baghurst, Baghurst, & Record, 1994; Elliott, Heller, Boyle, & Dobson, 1994). Patients with CHD have been found to reduce their fat intake after diagnosis (Koikkalainen, Mykkanen, Julkunen,

Saarinen, & Lappalainen, 2002) or after surgery (Falk, Bisogni, & Sobal, 2000) and this may have been the case with these patients, although this evaluation did not investigate this. Fat-containing foods eaten more regularly by participants were pastries, cakes, sweet biscuits, croissants and cheese.

Prior to NE, regression analysis showed that those with a more positive attitude to healthy eating, those receiving previous professional nutritional advice and women had a lower fat intake than other CR participants (Table 20, p. 161). This supports previous research showing that attitude is more strongly related to dietary behaviour (Shepherd & Towler, 1992; Wright, 1994). Participants appear to believe in the health benefits of cardiac diets, but are unsure about their compliance with cardiac diets in the longer term.

In the Part 3 impact evaluation (Chapter 6), all groups improved in knowledge at post-test, irrespective of exposure to NE but the group having weekly NE totalling 4½ hours, with additional individual dietary advice, had a greater improvement (Table 28, p. 184). In the comparison group not exposed to NE, the improvement in knowledge may have been due to the questionnaire raising awareness and prompting patients to seek further information.

Attitude improved in the 4½-hour NE group only. Deficiencies in the questionnaire mean that these results are difficult to interpret. The lack of change detected in the 1-hour group may have been because baseline attitudes were good and there was little room for improvement, the questionnaire was unable to detect small changes, there was an insufficient number of NE sessions, too little time between measurements to affect this parameter or the type of NE in the 1-hour group had no effect on attitude. As no behavioural educational methods were used in this group and NE time was extremely limited, attitude change would not

be expected. More research is needed to develop an accurate attitude measure for CR participants and to assess the importance of attitude in dietary change.

The comparison group had a small reduction in fat intake in the absence of NE and the questionnaire may have had a prompting effect. However, there was no significant difference in reduction in fat intake between the comparison and 1-hour NE groups. The 4½-hour group had a greater fat intake reduction and the reduction in fat intake was associated with increased knowledge but not with improved attitude (Table 29, p. 186), contrary to research linking attitude to behaviour change (Shepherd, 1989; Shepherd & Stockley, 1987). However, this supports research suggesting that knowledge may be important for the process of following a diet for heart disease (Kristal, Bowen, Curry, Shattuck, & Henry, 1990). A higher knowledge level has been found to be associated with reduced fat intake (Kristal et al., 1990; Wardle et al., 2000) and post-MI men who perceive their pre-MI diet to be unhealthy are more likely to consider changes (Newens, McColl, & Bond, 1997).

It appears that the knowledge-based NE delivered weekly in the 4½-hour group was associated with dietary change but some of this change may have been related to the individual advice given by the dietitian outside the formal NE session. It would be expected that weekly NE sessions would provide more opportunities for introducing information in stages, building on concepts from week to week and more support and feedback for participants trying out new behaviours, all of which would be reinforced by individual advice.

Knowledge of serum cholesterol has been found to be important in motivating dietary change (Aubin, 1998; Rushworth et al., 1990) but the Part 2 process evaluation showed that few CR participants reported having an elevated

serum cholesterol.

The Part 4 process evaluation of participants' satisfaction with NE found that satisfaction was generally high (Table 30, p. 194) but older participants were slightly less satisfied overall. More exposure to NE was only weakly related to higher overall satisfaction. Although age was not a barrier to further reduction of dietary fat during CR, older participants appear to have less understanding and were more confused.

**Hypothesis 3: Compliance with low-fat diets in CR patients is reduced one year after leaving the CR program.**

The Part 5 outcome evaluation (Chapter 8) showed that most CR patient had increased their BMI at twelve-month follow-up (Figure 14, p. 203), a similar finding to that of another Australian study of CABG patients twelve months after CR (Oldenburg, Martin, Greenwood, Bernstein, & Allan, 1995). Almost half of patients with increased BMI were in the overweight or obese BMI category at the CR program and a greater BMI was associated with a higher saturated fat, alcohol and energy intake (Table 41, p. 216), showing that specific intervention and on-going monitoring is needed for these patients.

The Part 5 outcome evaluation also showed that, after the NE session(s), dietary fat knowledge had increased post-NE but attitudes and intake had not changed (Table 32, p. 205), possibly due to the fact that attitudes were positive and fat intake relatively low prior to NE. Patients had been exposed to one or two sessions of NE only and this appears insufficient to stimulate further changes.

No change was detected between the post-NE scores and the scores at twelve-month follow-up, indicating that knowledge gained during the program and positive attitudes and low-fat diets can be maintained over time. This accords with other research showing that CR participants can maintain dietary compliance long-term (Lidell & Fridlund, 1996; Reid & Mulcahy, 1987).

Overall, saturated fat was slightly higher than recommended for secondary prevention and PUFA and carbohydrates were slightly lower, although sugar intake was high (Table 34, p. 208) and intake of vegetables and nuts was less than desirable (Table 40, p. 214). Participants may be increasing intake of sugar-containing foods as a substitute for high-fat foods and avoiding potentially

beneficial foods such as nuts because of the emphasis on total fat reduction.



## Recommendations

Research about the effectiveness of different types of NE is conflicting, with some NE studies showing that behavioural techniques are associated with better dietary outcomes (Contento et al., 1995; Travers, Tan, MacCleave, Murphy, & Whiting, 1992) but a meta-analysis of controlled trials of cardiac patient education showing no differences in outcome according to educational method (Mullen, Mains, & Velez, 1992). Knowledge-based education is believed to be effective only if people are self-selected and motivated (Contento et al., 1995) and may be more important for the process of following a healthy diet than for increasing motivation for dietary change (Kristal et al., 1990).

The Part 3 impact evaluation has shown that knowledge-based, didactic NE once weekly for six weeks, combined with limited individual counselling, is effective in increasing dietary fat knowledge, improving attitude to healthy eating and reducing fat intake (Table 28, p. 184). In the program in which these results were found, the CR format was two exercise and education sessions per week for six weeks, with twenty to twenty-five participants per session. NE (described in Chapter 6, pp. 174-175) was lecture-style with a question-answer format rather than true group discussion. The dietitian also attended one of the twice-weekly exercise sessions and participants were able to discuss more specific issues while undertaking the prescribed exercises. It was not possible to establish whether the type of NE, the amount of NE, the skills of the nutrition educator, the individual advice given informally by the dietitian during the exercise component or other factors were responsible for the outcome and the quasi-experimental nature of the trial means that the results cannot be generalised to all CR programs.

The Part 2 process evaluation has shown that CR patients have lower fat

diets than an Australian population prior to NE (Table 16, p.156). Although this evaluation did not reveal whether patients had changed their diets because of their heart condition, other research has shown that patients with CHD reduce dietary fat intake after diagnosis (Koikkalainen et al., 2002) or cardiac surgery (Gaw-Ens & Laing, 1994). CR patients may therefore benefit from a knowledge-based approach to assist with dietary compliance, rather than a motivational approach to initiate dietary change. This evaluation has shown that knowledge-based group education can be effective if delivered in the format described above, which reinforces findings from other studies that have shown that knowledge-based education is effective in self-selected, motivated subjects (Contento et al., 1995). In the Part 2 process evaluation, CR participants were found to have relatively low-fat diets prior to NE and, in people who have already made dietary changes, knowledge-based education may be more important than behavioural education as it provides information necessary for the process of selecting healthier foods (Kristal et al., 1990).

The Part 2 process evaluation has shown that participants appear to believe in the health benefits of cardiac diets, but are unsure about their compliance with cardiac diets in the longer term and this needs to be addressed in the education process by discussing strategies for dietary lapses and relapses. In the Part 3 impact evaluation, the questionnaire appeared to raise awareness and prompted patients to seek further information. If so, a questionnaire could be used routinely on entry to the program for this purpose and to identify misconceptions and lack of understanding that may inhibit progress with dietary improvement. NE may need to target males and those with no previous professional nutritional advice for specific intervention. As knowledge of serum cholesterol has been

found to be important in motivating dietary change (Aubin, 1998; Rushworth et al., 1990) and few CR participants reported having an elevated serum cholesterol, it may be useful for CR programs to increase patients' awareness of serum lipids and encourage regular monitoring as a tool for measuring the success of both diet and drug therapy.

The Part 5 outcome evaluation showed that BMI had increased in many patients and a higher BMI was associated with higher intake of saturated fat, alcohol and energy. More focus on alcohol and overall energy intake may be needed during CR, in conjunction with advice on saturated fat, to encourage weight loss and prevent undesirable increases in BMI post-CR. As energy restriction is important for weight loss, CR programs may need to identify inappropriate dietary habits in individual patients in order to personalise weight loss advice. It would be useful to monitor all Victorian CR patients by routine measurement of abdominal girth, which appears to be a more accurate measure of CHD risk than BMI (Després et al., 1990). Overweight participants have been found to benefit from specific, structured weight loss interventions (Savage, Lee, Harvey-Berino, Brochu, & Ades, 2002; Bader et al., 2001) and this is recommended for CR. If such interventions cannot be provided within the CR program, these patients should be referred for individual counselling. As weight loss requires a long-term approach, follow-up sessions after exiting the CR program would be needed until weight is acceptable and stabilised. Referral to Phase 3 community-based CR programs on exit would be useful but at present there are a limited number of these programs.

The Part 4 process evaluation has shown that participants found lecture material, overhead transparencies, group discussion, handouts and food product

displays particularly helpful. Another study of patients with CHD also found preferences for structured teaching combined with visual material (Merritt, 1991) and written handouts have been found useful (Murray, 1989). Verbal delivery of complex information in a short period of time is not ideal and may need to be backed up by handout material covering the key points and practicalities, especially for older participants. It may help to provide such written material before the NE session, preferably on entry to the program, and concentrate on answering questions and clarifying the information at the NE sessions, especially in programs with only one session. The written information would need to address the key concerns of patients with CHD and be in a clear, easy-to-follow format.

Older patients were less satisfied overall with NE and may need specifically tailored NE that addresses issues of relevance and understanding, using a slower, less detailed information delivery that is presented visually. There may be a particular need for several sequential NE sessions to allow older participants to absorb the information.

Until further research is carried out, it is recommended that NE continues to offer some lecture-style education but combines this with well-accepted adult education approaches, interactive group discussion, visual educational aids and handout material and the opportunity for individual dietary counselling. A review of studies that used behavioural models to predict intake of fat, fruit and vegetables was not able to identify one model that was a better predictor than any other (Baranowski, Cullen, & Baranowski, 1999). No specific behavioural model can be recommended at this time but standard adult educational strategies as recommended by American Association of Cardiovascular and Pulmonary

Rehabilitation (Miller & Taylor, 1995), are expected to be useful, as follows:

- Providing positive, accurate expectations about results - informing participants about health benefits and the time-frame of expected results;
- Identifying precisely defined, individualised behaviour changes - assessing the individual's current diet and the changes needed;
- Setting realistic goals - establishing long-term goals such as serum cholesterol- lowering or weight loss and short-term goals involving desired eating behaviours;
- Contracting - writing contracts or agreements to formalise the commitment to change;
- Preventing lapses and relapses - identifying situations/feelings that may cause a lapse and formulating coping strategies;
- Modelling - observing others performing healthy eating behaviours;
- Prompting - using reminders to prompt behaviours;
- Giving feedback - providing progress reports from a health professional;
- Problem solving - identifying difficulties and solutions;
- Rewarding progress - using material rewards or praise;
- Enhancing social support - promoting encouragement from family and friends.

Other adult education strategies likely to be appropriate for CR patients include the use of techniques to foster independence and self-direction and the provision of information relevant to the individual (Padberg & Padberg, 1990). As studies of MI patients have found that very few believed that dietary factors contributed to their heart attack (Greenwood, Packham, Muir, & Madeley, 1996; Abbott & Berry, 1989; Davison, 1980), the link between diet and heart disease

needs to be emphasised in NE. The concept that dietary change is important and possible needs to be promoted and time allotted for a step-wise process of learning new behaviours, seeing proof of success and practising new behaviours so that they become incorporated into the patient's lifestyle (Girdano & Dusek, 1988).

The Part 1 process evaluation has shown that most programs offer only one or two NE sessions (Figure 2, p. 131). A group discussion format is required that is responsive to the individual needs of participants and a sufficient number of sessions needs to be offered at regular intervals over the course of the program to allow incorporation of the recommended strategies. An intervention that appears to be particularly helpful for modifying dietary fat intake is goal-setting (Ammerman, Lindquist, Lohr, & Hersey, 2002) and this is specifically recommended by the Australian Cardiac Rehabilitation Association, the Heart Research Centre, the American Heart Association and the American Association of Cardiovascular and Pulmonary Rehabilitation (Australian Cardiac Rehabilitation Association, 1999; Goble & Worcester, 1999; Balady et al., 2000; Miller & Taylor, 1995) and should be incorporated in all programs.

The Part 1 process evaluation found that the number of CR participants varies from one to twenty in most programs, with some having up to forty, and it would be difficult to tailor information to specific needs and have a genuine group discussion format in the larger groups. It would be helpful to maintain a manageable group size by dividing up large groups but, as lack of dietitians' time was a reported barrier to NE in the Part 1 evaluation (Table 8, p. 139), this may not be practicable.

As the Part 2 process evaluation found that fat-containing foods eaten

more regularly by participants were pastries, cakes, sweet biscuits, croissants and cheese, it would be helpful to identify such “problem” foods and other sources of hidden fat and provide more information in NE sessions on acceptable substitutes for favourite high-fat foods. The Part 5 outcome evaluation has shown that participants may be increasing intake of sugar-containing foods as a substitute for high-fat foods and more education on substitution with beneficial or non-atherogenic fats, such as MUFA and PUFA, is needed. NE may need to place more emphasis on the importance of choosing high-fibre carbohydrate foods, as recommended (Krauss, Eckel, Howard, & et al, 2000), rather than sweetened, refined products. As PUFA intake was low, NE may need to give more information on “good fats” and the benefits of nuts, rather than emphasising strict reduction of all fatty foods. The emphasis has moved from a focus on total fat intake to adjusting the type of fat in the diet (National Heart Foundation of Australia, 1999) and NE in CR programs needs to be continually up-dated to accord with the latest recommendations for patients with CHD.

The Part 4 process evaluation has shown that some patients would like more information on recipes, eating out and weight loss and additional information on these topics could be provided in handout material. The emphasis on reducing dietary fat in many programs needs to be balanced with information on beneficial fats, fish, fruit, vegetables, legumes, whole grains, nuts and other protective dietary factors. In the Part 3 impact evaluation, nutrition knowledge in CR participants was associated with dietary improvements but knowledge prior to NE was poor and a standardised NE content consistent with the latest recommendations would help to improve knowledge and avoid confusion by exposure to conflicting advice. Content would need to be regularly up-dated in

line with the latest research and be uniform across different programs.

The Part 1 process evaluation found that more than half the nutrition educators requested HF assistance with program planning guidelines (Table 9, p. 140) and it would be helpful if specialist bodies, such as the HF, could assist with the development of a standardised set of regularly-updated modules, based on adult education principles, that could be used by nutrition educators in all programs.

The dietary fat knowledge questionnaire had an adequate level of internal consistency and had been appropriately tested for validity and reliability and would appear to be a useful measure of dietary fat knowledge in this population. The healthy eating attitude questionnaire, although designed and validated for a CR population in Australia (Read, 1994), had a lower level of internal consistency than desirable and may need further development before it can be used as an accurate measure of attitude.

A short food frequency questionnaire was considered more suitable for CR participants (as discussed in the Methods section, Chapter 3, p. 103), despite the fact that a seven-day weighed-food record is a more widely-accepted standard measure of dietary intake (Friedenrich, Slimani, & Riboli, 1992). The fat intake questionnaire (Dobson et al., 1993) used in this evaluation was found to have several deficiencies, as reported in the Part 2 process evaluation discussion (Chapter 5, pp. 166-167). Main problems related to the limited range of food sources of saturated fat, inclusion of beneficial fats, such as oils and nuts, the use of the term "ice cream" and "cheese" instead of "regular ice cream" and "regular cheese" and the meat and milk questions. Recommendations are to change the meat question (item 5) to read "How often do you eat meat grilled or roasted with



added fat ....never, less than once a week, once or twice a week, three to five times a week, six or more times a week” and add two other similar questions relating to “stewed or goulash” meat (possibly “casserole or pot roast meat” would be a better term) and “fried meat”. “Fried meat” can be a misleading term, as stir-frying in a small amount of oil would not be as unhealthy as frying meat in a large amount of butter, lard or dripping. “Meat fried in animal fat” or “meat fried in butter, ghee, lard or dripping” could be a better term. The milk question (item 15) could be changed to read “How often do you use full cream milk in cooking or in tea and coffee....never, less than once a week, once or twice a week, three to five times a week, six or more times a week”. A similar question could be added for condensed milk.

The Part 1 process evaluation found that well-designed evaluations are not commonly used (Table 6, p. 138) but are needed to assess the effectiveness of the NE process and its impact and outcomes. In spite of the questionnaire deficiencies, total fat intake scores showed strong internal consistency and significant correlations with total and saturated fat intake, as measured by a well-established food frequency questionnaire used in the Part 5 outcome evaluation (Figures 15 and 16, p. 215), and, if modified and re-validated, could be a useful and convenient tool for evaluation of NE.

### **Summary of Main Recommendations for NE in Outpatient CR Programs**

#### **CR Coordinators/Program Managers**

1. Identify and monitor overweight participants by waist measurements and target them for specific weight-loss interventions;
2. Increase participants' awareness of serum lipids and provide monitoring, together with waist measurement monitoring, as objective measures of CR

outcomes;

3. Increase the time devoted to NE by offering weekly NE sessions during the course of the CR program.

#### Nutrition Educators

1. Use knowledge-based NE in a group discussion format, in accordance with recommendations for adult education;
2. Provide additional individual dietary advice;
3. Update NE content in line with the latest research.

#### Conclusion

This evaluation has shown that four and a half hours of knowledge-based didactic NE spread over six weekly sessions, together with additional access to a dietitian for individual advice, appears to be effective at improving dietary fat knowledge, attitude and intake. Other factors, apart from the amount of NE exposure, may have been associated with these positive outcomes, including the skills of the nutrition educator, the support provided by the other CR staff, the type of accessory handout material and teaching aids used or the individual advice given informally by the dietitian during the exercise component. It would be useful to evaluate the impact of different program elements separately to clarify this. If most of the positive effect was found to be due to formal NE, programs with only one or two NE sessions would need to allot more time to NE.

The quasi-experimental nature of the impact evaluation means that these results might not be totally representative of all other programs but, overall, the five evaluations provide a useful knowledge base for further research into the NE component of CR in Australia. If the impact evaluation results are born out by further research, the emphasis of NE may need to be on supporting and

reinforcing existing dietary changes and “fine-tuning” diets, rather than the use of techniques aimed at initiating change.

More research is required to identify the most appropriate structure, content and delivery of NE and to determine the underlying health behaviour model most relevant and the education strategies most effective in patients with CHD. The stage of change and the self-efficacy models have been shown to be related to fat intake (Greene & Rossi, 1998). Randomised experimental trials using each model and comparing these with standard adult education strategies would be useful to help determine which is the most effective approach. There is also a need to investigate patients with poorer outcomes in order to increase the effectiveness of NE in this group and to address the problem of overweight and obesity and continued weight gain after leaving the program. In the meantime, programs should be encouraged to offer weekly NE sessions based on adult education approaches, with additional access to dietitians for individual advice, to ensure that pre-existing dietary changes are maintained and to facilitate further improvements.

#### **Areas requiring Further Research**

Further research into dietary behaviour in CR participants is needed, as recommended by Baranowski, Cullen, & Baranowski (1999), using longitudinal study designs, non-self-reporting of dietary behaviour to add to the self-reported data, taking the characteristics of the subject group into account and combining elements of different theories to create a more comprehensive educational model.

Research into the following aspects of NE is needed:

1. Identification of a suitable theoretical model for CR education;
2. Investigation of the most effective NE strategies for CR participants, including those most effective in men and older people;
3. Investigation of the effectiveness of different program elements;
4. Investigation of the factors determining overweight and obesity in patients with CHD and effective intervention methods;
5. Investigation of the role of knowledge and attitude in dietary habits, including identifying more suitable measures of attitude in CR participants;
6. Modification and validation of the fat intake questionnaire to enable its wider use as an evaluation tool;
7. Investigation of those not responding to NE, in order to increase the effectiveness of NE.

Further research is necessary to clarify many of the findings of this evaluation, but this evaluation has revealed a considerable amount of useful information about CR participants and current NE practices and has raised specific issues. As time and resources are limited, it may be difficult to undertake further research or to incorporate all of the suggested improvements unless funding is increased and nutrition educators are given more time to devote to CR. However, as CHD is a major health problem in Australia (Mathur, 2002) and dietary intervention has been found to be effective for secondary prevention (Hooper et al., 2001), it is proposed that more time and resources be allocated to NE in Victorian outpatient CR programs and that this research be undertaken as a priority.

## REFERENCES

- Abbott, J., & Berry, N. (1989). Personal attribution for myocardial infarction and life-style prior to the event. *Health Educ J*, 48, 77-82.
- Ades, P., Huang, D., & Weaver, S. (1992a). Cardiac rehabilitation participation predicts lower rehospitalization costs. *Am Heart J*, 123(4 (Part 1), 916-921.
- Ades, P., Waldmann, M., McCann, W., & Weaver, S. (1992b). Predictors of cardiac rehabilitation participation in older coronary patients. *Arch Intern Med*, 152, 1033-1035.
- Ades, P., Waldmann, M., Polk, D., & Coflesky, J. (1992c). Referral patterns and exercise response in the rehabilitation of female coronary patients aged greater than or equal to 62 years. *Am J Cardiol*, 69(17), 1422-1425.
- Ajzen, J. (1988). *Attitudes, personality and behaviour*. Milton Keynes: Open University Press.
- Ajzen, J., & Fishbein, M. (1980). *Understanding attitudes and predicting social behaviour*. Englewood Cliffs: Prentice-Hall.
- Ali, N. (2002). Prediction of coronary heart disease preventive behaviors in women: test of the health belief model. *Women Health*, 35(1), 83-96.
- American Association of Cardiovascular and Pulmonary Rehabilitation. (1995). *Guidelines for Cardiac Rehabilitation Programs*. (2 ed.). Champaign: Human Kinetics.
- Ammerman, A., Lindquist, C., Lohr, K., & Hersey, J. (2002). The efficacy of behavioral interventions to modify dietary fat and fruit and vegetable intake: a review of the evidence. *Prev Med*, 35(1), 25-41.
- Arntzenius, A., Kromhout, D., Barth, J., & "et al". (1985). Diet, lipoproteins and the progression of coronary atherosclerosis: the Leiden Intervention Trial. *N Eng J Med*, 312, 805-11.
- Ascherio, A., Rimm, E., Giovannucci, E., Spiegelman, D., Stampfer, M., & Willett, W. (1996). Dietary fat and risk of coronary heart disease in men: cohort follow-up study in the United States. *Br Med J*, 313, 84-90.
- Assman, G., Schulte, H., & von Eckardstein, A. (1996). Hypertriglyceridemia and elevated levels of lipoprotein (a) are risk factors for major coronary events in middle-aged men. *Am J Cardiol*, 77, 1179-1184.
- Aubin, M., Godin, G., Vezina, L., Maziade, J., & Desharnais, R. (1998). Hypercholesterolemia screening. Does knowledge of blood cholesterol level affect dietary fat intake? *Can Fam Physician*, 44, 1289-1297.
- Austin, M., Hokanson, J., & Edwards, K. (1998). Hypertriglyceridemia as a cardiovascular risk factor. *Am J Cardiol*, 81, 7-12.
- Australian Bureau of Statistics. (1997). *National nutrition survey: foods eaten 1995*. Canberra: Australian Bureau of Statistics.
- Australian Cardiac Rehabilitation Association. (1999). *A practitioner's guide to cardiac rehabilitation*. Sydney: Australian Cardiac Rehabilitation Association.
- Australian Institute of Health & Welfare (Ed.). (2001). *Heart, stroke and vascular diseases - Australian facts 2001*. (Vol. 14). Canberra: AIHW, National Heart Foundation of Australia, National Stroke Foundation of Australia.
- Axelsson, M. L., Federline, T. L., & Brinberg, D. (1985). A meta-analysis of food and nutrition-related research. *J Nutr Educ*, 17, 51-54.

- Bader, D., Maguire, T., Spahn, C., O'Malley, C., & Balady, G. (2001). Clinical profile and outcomes of obese patients in cardiac rehabilitation stratified according to the National Heart, Lung and Blood Institute criteria. *J Cardiopulm Rehabil*, 21(4), 210-7.
- Baghurst, K., Baghurst, P., & Record, S. (1994). Demographic and dietary profiles of high and low fat consumers in Australia. *J Epidemiol Community Health*, 48(1), 26-32.
- Bakx, J., Stafleu, A., van Staveren, W., van den Hoogen, H., & van Weel, C. (1997). Long-term effect of nutritional counseling: a study in family medicine. *Am J Clin Nutr*, 65(Suppl), 1946S-1950S.
- Balady, G., Ades, P., Comoss, P., Limacher, M., Pina, I., Southard, D., Williams, M., & Bazzare, T. (2000). Core components of cardiac rehabilitation /secondary prevention programs: a statement for healthcare professionals from the American Heart Association and the American Association of Cardiovascular and Pulmonary Rehabilitation. *Circulation*, 102, 1069-1073.
- Bandura, A. (1982). Self-efficacy in human agency. *Am Psychol*, 37, 122-147.
- Bandura, A. (1986). *Social foundations of thought and action*. Englewood Cliffs, NJ: Prentice-Hall.
- Baranowski, T., Cullen, K., & Baranowski, J. (1999). Psychosocial correlates of dietary intake: advancing dietary intervention. *Ann Rev Nutr*, 19, 17-40.
- Barbarowicz, P., Nelson, M., DeBusk, R., & Haskell, W. (1980). A comparison of in-hospital education approaches for coronary bypass patients. *Heart Lung*, 9, 127-133.
- Bennett, S., Dobson, A., & Magnus, P. (1995). *Outline of a national monitoring system for cardiovascular disease* (Cardiovascular Disease Series No.4). Canberra: AIHW.
- Benson, G. (2000). Review: psychoeducational programmes reduce long term mortality and recurrence of myocardial infarction in cardiac patients. *Evidence-Based Nursing*, 3(3), 80.
- Bethell, H., Turner, S., Evans, J., & Rose, L. (2001). Cardiac rehabilitation in the United Kingdom. How complete is the provision? *J Cardiopulm Rehabil*, 21, 111-115.
- Beynen, A., Katan, M., & van Zutphen, L. (1987). Hypo- and hyper-responders: individual differences in the response of serum cholesterol concentration to changes in diet. *Adv Lipid Res*, 22(11b), 1.
- Block, G., Clifford, C., Naughton, M., Henderson, M., & McAdams, M. (1989). A brief screen for high fat intake. *J Nutr Ed*, 21(5), 199-207.
- Bousney, C., Beresford, S., Omenn, G., & Motulsky, A. (1995). A quantitative assessment of plasma homocysteine as a risk factor for vascular disease. *JAMA*, 274, 1049-1057.
- Brown, A., & Hu, F. (2001). Dietary modulation of endothelial function: implications for cardiovascular disease. *Am J Clin Nutr*, 73, 673-686.
- Brown, I., Rosner, B., Willett, W., & Sacks, F. (1999). Cholesterol-lowering effects of dietary fibre. *Am J Clin Nutr*, 69, 30-42.
- Bunker, S., McBurney, H., Cox, H., & Jelinek, M. (1999). Identifying participation rates at outpatient cardiac rehabilitation programs in Victoria, Australia. *J Cardiopulm Rehabil*, 19, 334-338.
- Burke, L. (1981). Learning and retention in the acute care setting. *Crit Care Quart*, 4(4), 67-73.

- Burr, M., Gilbert, J., Holliday, R., Elwood, P., Fehily, A., Rogers, S., Sweetnam, P., & Deadman, N. (1989). Effects of change in fat, fish and fibre intakes on death and myocardial reinfarction: diet and reinfarction trial (DART). *Lancet*, 2, 757-761.
- Burr, M., Sweetnam, P., & Fehily, A. (1994). Diet and reinfarction. *Eur Heart J*, 15, 1152-1153.
- Buttriss, J. (1997). Food and nutrition: attitudes, beliefs and knowledge in the United Kingdom. *Am J Clin Nutr*, 65(Suppl), 1985S-1995S.
- Caggiula, A., & Mustad, V. (1997). Effects of dietary fat and fatty acids on coronary artery disease risk and total and lipoprotein cholesterol concentrations: epidemiological studies. *Am J Clin Nutr*, 65 (Suppl), 1597S-1610S.
- Cannistra, L., Balady, G., O'Malley, C., Weiner, D., & Ryan, T. (1992). Comparison of the clinical profile and outcome of women and men in cardiac rehabilitation. *Am J Cardiol*, 69(16), 1274-1279.
- Carmody, T., Matarazzo, J., & Istvan, J. (1987). Promoting adherence to heart-healthy diets: a review of the literature. *J Compliance Health Care*, 2, 105.
- Castelein, P., & Kerr, J. (1995). Satisfaction and cardiac lifestyle. *J Adv Nurs*, 21(3), 498-505.
- Centers for Disease Control and Prevention. (1999). *Framework for program evaluation in public health*. (Vol. RR-11). Atlanta: Epidemiology Program Office, CDC, US Dept. of Health and Human Services.
- Chisholm, A., Mann, J., Sutherland, W., Williams, S., & Ball, M. (1993). Dietary management of patients with familial hypercholesterolaemia treated with simvastatin. *Quart J Med*, 86(1), 70-71.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Conn, V., Taylor, S., & Casey, B. (1992). Cardiac rehabilitation program participation and outcomes after myocardial infarction. *Rehabil Nurs*, 17(2), 58-62.
- Connor, S., & Connor, W. (1997). Are fish oils beneficial in the prevention and treatment of coronary artery disease. *Am J Clin Nutr*, 66 (Suppl)1020S-1031S.
- Connor, S., Gustafson, J., Sexton, G., Becker, N., Artaud-Wild, S., & Connor, W. (1992). The diet habit survey: a new method of dietary assessment that relates to plasma cholesterol changes. *J Am Diet Assoc*, 92, 41-47.
- Connor, W. (1996). The decisive influence of diet on the progression and reversibility of coronary heart disease. *Am J Clin Nutr*, 64, 253-254.
- Contento, I., Balch, G., Bronner, Y., Paige, D., Gross, M., Bisignani, L., Lytle, L., Maloney, S., White, S., Olson, C., & Awadener, S. (1995). The effectiveness of nutrition education and implications for nutrition education policy, programs and research: a review of research. *J Nutr Educ*, 27(6), 277-420.
- Contento, I., & Morin, K. (1986). *Manual for developing a nutrition education curriculum*. Paris: UNESCO.
- Cooper, A., Jackson, G., Weinman, J., & Horne, R. (2002). Factors associated with cardiac rehabilitation attendance: a systematic review of the literature. *Clin Rehabil*, 16(5), 541-552.

- Cooper, A., Lloyd, G., Weinman, J., & Jackson, G. (1999). Why patients do not attend cardiac rehabilitation: the role of intentions and illness beliefs. *Heart*, 82(2), 234-236.
- Corti, M., Guralnik, J., Salive, M., Harris, T., Ferucci, L., Glynn, R., & Havlik, R. (1997). Clarifying the direct relation between total cholesterol levels and death from coronary heart disease in older persons. *Ann Intern Med*, 126, 753-760.
- Corti, M., Guralnik, J., Salive, M., Harris, T., Field, T., Wallace, R., Berkman, L., Seeman, T., GLynn, R., Hennekens, C., & Havlick, R. (1995). HDL cholesterol predicts coronary heart disease mortality in older persons. *JAMA*, 274(7), 539-544.
- Coulston, A., Hollenbeck, C., Swislocki, A., & Reaven, G. (1989). Persistence of hypertriglyceridemic effect of high-carbohydrate low-fat diets in NIDDM patients. *Diabetes Care*, 12, 94-101.
- Crawford, D., & Baghurst, K. (1990). Diet and health: a national survey of beliefs, behaviours and barriers to change in the community. *Aust J Nutr Diet*, 74, 97-104.
- Cupples, S. (1991). Effects of timing and reinforcement of preoperative education on knowledge and recovery of patients having coronary artery bypass graft surgery. *Heart Lung*, 20(6), 654-660.
- Curry, S., Kristal, A., & Bowen, D. (1992). An application of the stage model of behaviour change to dietary fat reduction. *Health Educ Res*, 7(1), 97-105.
- Daly, J., Sindone, A., Thompson, D., Hancock, K., Chang, E., & Davidson, P. (2002). Barriers to participation in and adherence to cardiac rehabilitation programs: a critical literature review. *Prog Cardiovasc Nurs*, 17(1), 8-17.
- Danesh, J., Collins, R., & Peto, R. (2000). Lipoprotein(a) and coronary heart disease: a meta-analysis of prospective studies. *Circulation*, 102, 1082-1085.
- Davison, L. (1980). An analysis of knowledge, belief and behaviour relating to the development of coronary heart disease. *Health Educ J*, 39(103-9).
- de Lorgeril, M., Renaud, S., Mamelle, N., Salen, P., Martin, J., Monjaud, I., Guidollet, J., Touboul, P., & Delaye, J. (1994). Mediterranean alpha-linolenic acid-rich diet in secondary prevention of coronary heart disease. *Lancet*, 343(Jun 11), 1454-1459.
- Denke, M. (1995). Cholesterol-lowering diets. A review of the evidence. *Arch Intern Med*, 155(1), 1684-1685.
- Denke, M. (1999). Revisiting the effectiveness of the National Cholesterol Education Program's Step I and Step II diets: cholesterol-lowering diets in a pharmaceutically driven world. *Am J Clin Nutr*, 69, 581-582.
- Derr, J., Kris-Etherton, P., Pearson, T., & Seligson, F. (1993). The role of fatty acid saturation on plasma lipids, lipoproteins and apolipoproteins. The plasma total and low-density lipoprotein cholesterol response of individual fatty acids. *Metabolism*, 42, 130-134.
- Després, J., Lemieux, I., & Prudhomme, D. (2001). Treatment of obesity: need to focus on high risk abdominally obese patients. *BMJ*, 322(24 March), 716-720.
- Després, J., Moorjani, S., Lupien, P., Tremblay, A., Nadeau, A., & Bouchard, C. (1990). Regional distribution of body fat, plasma lipoproteins and cardiovascular disease. *Arteriosclerosis*, 10(497-511).



- Dietary Guidelines Advisory Committee. (1995). *Report of the Dietary Guidelines Advisory Committee on the Dietary Guidelines for Americans*. Washington, DC: US Dept of Health and Human services and US Dept of Agriculture.
- Dishman, R. (1988). *Exercise adherence: its impact on public health*. Champaign, IL: Human Kinetics Publishers.
- Dobson, A., Blijlevens, R., Alexander, H., Croce, N., Heller, R., Higginbotham, N., Pike, G., Plotnikoff, R., Russell, R., & Walker, R. (1993). Short fat questionnaire: a self-administered measure of fat-intake behaviour. *Aust J Pub Health, 17*(2), 144-149.
- Dorn, J., Naughton, J., Imamura, D., & Trevisan, M. (1999). Results of a multi-center randomized clinical trial of exercise and long-term survival in myocardial infarction patients: the National Exercise and Heart Disease Project (NEHDP). *Circulation, 100*, 1764-1769.
- Eckersley, R. (2001). Losing the battle of the bulge: causes and consequences of increasing obesity. *Med J Aust, 174*, 590-592.
- Elliott, H., Heller, R., Boyle, C., & Dobson, A. (1994). Current fat intake in people with and without a history of coronary heart disease. *Aust J Nutr Diet, 51*(4), 152-156.
- Engblom, E., Korpilahti, K., Hamalainen, H., Ronnema, T., & Puukka, P. (1997). Quality of life and return to work 5 years after coronary artery bypass surgery. Long-term results of cardiac rehabilitation. *J Cardiopulm Rehabil, 17*(1), 29-36.
- European Heart Network Expert Nutrition Group. (1998). *Food, nutrition and cardiovascular disease prevention in the European Union*. Brussels: European Heart Network.
- Evenson, K., & Fleury, J. (2000). Barriers to outpatient cardiac rehabilitation participation and adherence. *J Cardiopulm Rehabil, 20*, 241-246.
- Evenson, K., Rosamond, W., & Luepker, R. (1998). Predictors of outpatient cardiac rehabilitation utilization: the Minnesota Heart Survey registry. *J Cardiopulm Rehabil, 18*, 192-198.
- Expert Panel on Detection, Evaluation and Treatment of High Blood Cholesterol in Adults. (1988). The Expert Panel. Report of the National Cholesterol Education Project. *Arch Intern Med, 148*, 36-69.
- Expert Panel on Detection Evaluation and Treatment of High Blood Cholesterol in Adults. (2001). Executive summary of the third report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III). *JAMA, 285*(19), 2486-2497.
- Falk, L., Bisogni, C., & Sobal, J. (2000). Diet change processes of participants in an intensive heart program. *J Nutr Educ, 32*, 240-250.
- Field, A., Coakley, E., Must, A., Spadano, J., Laird, N., Dietz, W., Rimm, E., & Colditz, G. (2001). Impact of overweight on the risk of developing common chronic diseases during a 10-year period. *Arch Intern Med, 161*, 1581-1586.
- Fielding, J. (1985). Smoking: health effects and control Parts I & II. *N Engl J Med, 313*, 491-498, 555-561.
- Filip, J., McGillen, C., & Mosca, L. (1999). Patient preferences for cardiac rehabilitation and desired program elements. *J Cardiopulm Rehabil, 19*, 339-343.

- Finckenor, M., & Byrd-Bredbenner, C. (2000). Nutrition intervention group program based on preaction-stage-oriented change processes of the Transtheoretical Model promotes long-term reduction in dietary fat intake. *J Am Diet Assoc, 100*(3), 335-342.
- Folsom, A., Stevens, J., Schreiner, P., & McGovern, P. (1998). Body mass index, waist/hip ratio and coronary heart disease incidence in African Americans and Whites. Atherosclerosis Risk in Communities Study Investigators. *Am J Epidemiol, 148*(12), 1187-1194.
- Frame, C., Green, C., Herr, D., Myers, J., & Taylor, M. (2001). The stages of change for dietary fat and fruit and vegetable intake of patients at the outset of a cardiac rehabilitation program. *Am J Health Promot, 15*(6), 405-413.
- Friedenrich, C., Slimani, N., & Riboli, E. (1992). Measurement of past diet: review of previous and proposed methods. *Epidemiol Rev, 14*, 177-196.
- Gartside, P., Wang, P., & Glueck, C. (1998). Prospective assessment of coronary heart disease risk factors: the NHANES I epidemiologic follow-up study (NHEFS) 16-year follow-up. *J Am Coll Nutr, 17*(3), 263-269.
- Gaw-Ens, B., & Laing, G. (1994). Risk factor reduction in coronary angioplasty and myocardial infarction patients. *Can J Cardiovasc Nurs, 5*(1), 4-12.
- Girdano, D., & Dusek, D. (1988). *Changing health behaviour*. Scottsdale, AZ: Gorsuch Scarisbrook.
- GISSI-Prevenzione Investigation. (1999). Dietary supplementation with n-3 polyunsaturated fatty acids and vitamin E after myocardial infarction: results of the GISSI-Prevenzione Trial. *Lancet, 354*(447-455).
- Glanz, K. (1980). Compliance with dietary regimens: its magnitude, measurement and determinants. *Prev Med, 9*, 787.
- Glanz, K., Patterson, R., Kristal, A., DiClemente, C., Heimendinger, J., Linnan, L., & McLerran, D. (1994). Stages of change in adopting healthy diets: fat, fibre and correlates of nutrient intake. *Health Educ Q, 21*(4), 499-519.
- Goble, A., & Worcester, M. (1999). *Best practice guidelines for cardiac rehabilitation and secondary prevention: a synopsis*. Melbourne: Heart Research Centre on behalf of Department of Human Services Vic.
- Gottlieb, S. (1992). Cardiovascular benefits of smoking cessation. *Heart Disease and Stroke, 1*, 173-175.
- Green, L., & Anderson, C. (1986). *Community Health*. St Louis: Times Mirror/Mosby College Pub.
- Greene, G., & Rossi, S. (1998). Stages of change for reducing dietary fat intake over 18 months. *J Am Diet Assoc, 98*, 529-534.
- Greene, G., Rossi, S., Reed, G., Willey, C., & Prochaska, J. (1994). Stages of change for reducing dietary fat to thirty percent of energy or less. *J Am Diet Assoc, 94*, 1105-1110.
- Greenwood, D., Packham, C., Muir, K., & Madeley, R. (1996). Knowledge of the causes of heart attack among survivors and implications for health promotion. *Health Educ J, 55*, 215-225.
- Grundy, S. (1986). Comparison of monounsaturated fatty acids and carbohydrates for lowering plasma cholesterol. *N Engl J Med, 314*, 745-748.
- Grundy, S. (1994). Influence of stearic acid on cholesterol metabolism relative to other long-chain fatty acids. *Am J Clin Nutr, 60*(Suppl), 986S-990S.

- Hamalainen, H., Luurila, O., Kallio, V., & Knuts, L. (1995). Reduction in sudden deaths and coronary mortality in myocardial infarction patients after rehabilitation. *Eur Heart J*, *16*, 1839-1844.
- Hare, D., Fitzgerald, H., Darcy, F., Race, E., & Goble, A. (1996). Cardiac rehabilitation based on group light exercise and discussion. *J Cardiopulm Rehabil*, *15*, 186-192.
- Harlan, W., Sandler, S., Lee, K., Lam, L., & Mark, D. (1995). Importance of baseline functional and socioeconomic factors for participation in cardiac rehabilitation. *Am J Cardiol*, *76*(1), 36-39.
- Harris, W., Connor, W., Alam, N., & Illingworth, D. (1988). The reduction of postprandial triglyceridemia in humans by dietary n-3 fatty acids. *J Lipid Res*, *29*(1451-1459).
- Haskell, W., Alderman, E., Fair, J., Maron, D., Mackey, S., Superko, H., Williams, P., Johnstone, I., Champagne, M., Krauss, R., & Farquhar, J. (1994). Effects of intensive multiple risk factor reduction on coronary atherosclerosis and clinical cardiac events in men and women with coronary artery disease. The Stanford Coronary Risk Intervention Project (SCRIP). *Circulation*, *89*, 975-990.
- Hawe, P., Degeling, D., & Hall, J. (1990). *Evaluating Health Promotion*. Sydney: MacLennan & Petty.
- Hebert, J., Clemow, L., Pbert, L., Ockene, I., & Ockene, J. (1995). Social desirability bias in dietary self-report may compromise the validity of dietary intake measures. *Int J Epidemiol*, *24*, 389-398.
- Hedback, B., Perk, J., & Wodlin, P. (1993). Long-term reduction of cardiac mortality after myocardial infarction: 10 year results of a comprehensive rehabilitation program. *Eur Heart J*, *14*(6), 831-835.
- Hegsted, D., Ausman, L., Johnson, L., & Dallal, G. (1993). Dietary fat and serum lipids: an evaluation of the experimental data. *Am J Clin Nutr*, *57*, 875-883.
- Hegsted, D., R, M., Myers, M., & Stare, F. (1965). Quantitative effects of dietary fat on the cholesterol in man. *Am J Clin Nutr*, *17*, 281-295.
- Hellerstein, H., & Ford, A. (1957). Rehabilitation of the cardiac patient. *JAMA*, *164*, 225-231.
- Henkin, Y., Garber, D., Osterlune, L., & Darnell, B. (1992). Saturated fats, cholesterol and dietary compliance. *Arch Intern Med*, *152*, 1167-1174.
- Hooper, L., Summerbell, C., Higgins, J., Thompson, R., Capps, N., Smith, G., Riersma, R., & Ebrahim, S. (2001). Dietary fat intake and prevention of cardiovascular disease: systematic review. *BMJ*, *322*, 757-763.
- Hooper, L., Summerbell, C., Higgins, J., Thompson, R., Clements, G., Capps, N., Davey Smith, G., Riemersma, R., & Ebrahim, S. (2003). Reduced or modified dietary fat for preventing cardiovascular disease (Cochrane Review). *The Cochrane Library*, *1*.
- Howard, B., Hannah, J., Heiser, C., Jablonski, K., Paidi, M., Alarif, L., Robbins, D., & Howard, W. (1995). Polyunsaturated fatty acids result in a greater cholesterol lowering and less triacylglycerol elevation than do monounsaturated fatty acids in a dose-response comparison in a multiracial study group. *Am J Clin Nutr*, *62*, 392-402.
- Howell, W., McNamara, D., Tosca, M., Smith, B., & Gaines, J. (1997). Plasma lipid and lipoprotein responses to dietary fat and cholesterol: a meta-analysis. *Am J Clin Nutr*, *65*, 1747-1764.

- Hu, F., Rimm, M., Stampfer, M., Ascherio, A., Spiegelman, D., & Willett, W. (2000). Prospective study of major dietary patterns and risk of coronary heart disease. *Am J Clin Nutr*, 72(4), 912-921.
- Hu, F., & Stampfer, M. (1999). Nut consumption and risk of coronary heart disease: a review of epidemiologic evidence. *Curr Atheroscler Rep*, 1(3), 204-209.
- Hunink, M., Goldman, L., Tosteson, A., Mittleman, M., Goldman, P., Williams, L., Tsevat, J., & Weinstein, M. (1997). The recent decline in mortality from coronary heart disease, 1980-1990. *JAMA*, 277(7), 535-542.
- Hunninghake, D., Stein, E., Dujovne, C., & et al. (1993). The efficacy of intensive dietary therapy alone or combined with lovastatin in outpatients with hypercholesterolemia. *N Engl J Med*, 328, 1213-1219.
- Hunt, P., & Hillsden, M. (1996). *Changing eating and exercise behaviour: a handbook for professionals*. Oxford: Blackwell Science Ltd.
- International Task Force for Prevention of Coronary Heart Disease. (1999). Coronary Heart Disease: Reducing the Risk. *Arterioscler Thromb Vasc Biol*, 19(8), 1819-1824.
- Ireland, P. (1996). *Measuring dietary intake in a Melbourne cohort of men and women born in Australia, Italy and Greece*. Melbourne: Monash University Department of Medicine.
- Jackson, R., Scragg, R., & Beaglehole, R. (1991). Alcohol consumption and risk of coronary heart disease. *BMJ*, 303, 211-216.
- Johnson, D., & Johnson, R. (1985). Nutrition education: a model for effectiveness, a synthesis of research. *J Nutr Educ*, 17(2) (Suppl), S1-19.
- Johnson, M., & Vickery, C. (1990). Dietary practices, nutrition knowledge and attitudes of coronary heart disease patients. *Health Values*, 14(1), 3-8.
- Jolliffe, J., Rees, K., Taylor, R., Thompson, D., Oldridge, N., & Ebrahim, S. (2001). Exercise-based rehabilitation for coronary heart disease. *The Cochrane Library*, 2, 1-23.
- Jones, P. (1997). Regulation of cholesterol biosynthesis by diet in humans. *Am J Clin Nutr*, 66, 438-446.
- Jowett, N., & Thompson, D. (1989). *Comprehensive Coronary Care*. Harrow: Scutari Press.
- Judd, J., Clevidence, B., Muesing, R., & et al. (1994). Dietary trans fatty acids: effects on plasma lipids and lipoproteins of healthy men and women. *Am J Clin Nutr*, 59, 861-868.
- Katan, M. (2000). Trans fatty acids and plasma lipoproteins. *Nutr Rev*, 58, 188-191.
- Kemppainen, T., Rosendahl, A., Nuutinen, O., Ebeling, T., Pietinen, P., & Uusitupa, M. (1993). Validation of a short dietary questionnaire and a qualitative fat index for the assessment of fat intake. *Eur J Clin Nutr*, 47(11), 765-775.
- Keys, A. (1980). *Seven countries. A multivariate analysis of diet and coronary heart disease*. Cambridge: Harvard University Press.
- Keys, A., Anderson, J., & Grande, F. (1965). Serum cholesterol responses to changes in the diet. IV. Particularly saturated fatty acids in the diet. *Metabolism*, 14, 776-787.
- King, K., Humen, D., & Teo, K. (1999). Cardiac rehabilitation: the forgotten intervention. *Can J Cardiol*, 15(9), 970-985.

- Koikkalainen, M., Mykkanen, H., Julkunen, J., Saarinen, T., & Lappalainen, R. (2002). Changes in eating and weight control habits after myocardial infarction. *Patient Educ Couns*, 46(2), 125-30.
- Krauss, R., Eckel, R., Howard, B., & et al. (2000). AHA Dietary Guidelines; Revision 2000: a statement for healthcare professionals from the Nutrition Committee of the American Heart Association. *Circulation*, 102, 2296-2311.
- Kristal, A., Andrilla, C., Koepsell, T., Diehr, P., & Cheadle, A. (1998). Dietary assessment instruments are susceptible to intervention-associated response set bias. *J Am Diet Assoc*, 98, 40-43.
- Kristal, A., Bowen, D., Curry, S., Shattuck, A., & Henry, H. (1990). Nutrition knowledge, attitudes and perceived norms as correlates of selecting low fat diets. *Health Educ Res*, 5, 467-477.
- Kristal, A., Hedderson, M., Patterson, R., Neuhouser, M., & Neuhouser, M. (2001). Predictors of self-initiated, healthful dietary change. *J Am Diet Assoc*, 101(7), 672-766.
- Kromhout, D. (1996). Diet-heart issues in a pharmalocological era. *Lancet*, 348(November), S20-S22.
- Kromhout, D., Bosschieter, E., & de Lezenne Coulander, C. (1985). The inverse relation between fish consumption and 20-year mortality from coronary heart disease. *N Eng J Med*, 312(19), 1205-1209.
- Kromhout, D., Menotti, A., Bloemberg, B., Aravanis, C., Blackburn, H., Buzina, R., & al, e. (1995). Dietary saturated and trans fatty acids and cholesterol and 25-year mortality from coronary heart disease: the seven countries study. *Prev Med*, 24, 308-315.
- Kushi, L., Lenart, E., & Willett, W. (1995). Health implications of Mediterranean diets in light of contemporary knowledge. I. Plant foods and dairy products. *Am J Clin Nutr*, 61(Suppl), 1407-1415.
- Kushner, R. (1993). Long-term compliance with a lipid-lowering diet. *Nutr Rev*, 51(1), 16-18.
- Kwiterovich, P. (1997). The effect of dietary fat, antioxidants, and pro-oxidants on blood lipids, lipoproteins, and atherosclerosis. *J Am Diet Assoc*, 97(Suppl), S31-S41.
- Kwiterovich, P. (2000). The metabolic pathways of high-density lipoprotein, low-density lipoprotein and triglycerides: a current review. *Am J Cardiol*, 86(Suppl), 5L-10L.
- Lamon-Fava, S., Wilson, P., & Schaefer, E. (1996). Impact of body mass index on coronary heart disease risk factors in men and women: the Framingham Offspring Study. *Arterioscler Thromb*, 16, 1509-1515.
- Lavie, C., & Milani, R. (1996). Effects of cardiac rehabilitation and exercise training in obese patients with coronary artery disease. *Chest*, 109(1), 52-56.
- Lavie, C., & Milani, R. (1997). Effects of cardiac rehabilitation, exercise training and weight reduction on exercise capacity, coronary risk factors, behavioral characteristics and quality of life in obese coronary patients. *Am J Cardiol*, 79(4), 397-401.
- Lavie, C., Milani, R., & Littman, A. (1993). Benefits of cardiac rehabilitation and exercise training in secondary coronary prevention in the elderly. *Am J Cardiol*, 22(3), 678-683.

- Law, M., Wald, N., & Thompson, S. (1994). By how much and how quickly does reduction in serum cholesterol lower risk of ischaemic heart disease? *BMJ*, *130*, 367-373.
- Leaf, A., & Weber, P. (1988). Cardiovascular effects of n-3 fatty acids. *N Engl J Med*, *318*, 549-557.
- Levy, A., Fein, S., & Stephenson, M. (1993). Nutrition knowledge levels about dietary fats and cholesterol: 1983-1988. *J Nutr Educ*, *25*(2), 60-66.
- Lewis, C., Sims, L., & Shannon, B. (1989). Examination of specific nutrition health behaviours using a social cognitive model. *J Am Diet Assoc*, *89*, 194-202.
- Lichenstein, A., & Van Horn, L. (1998). Very low fat diets. *Circulation*, *98*, 935-939.
- Lidell, E., & Fridlund, B. (1996). Long-term effects of a comprehensive rehabilitation program after myocardial infarction. *Scand J Caring Sci*, *10*(2), 67-74.
- Linden, W., Stossel, C., & Maurice, J. (1996). Psychosocial interventions for patients with coronary artery disease: a meta-analysis. *Arch Intern Med*, *156*, 745-752.
- Lindholm, L., Ekbom, T., Dash, C., & et al. (1995). The impact of health care advice given in primary care on cardiovascular risk. *BMJ*, *310*, 1105-1109.
- Lorig, K. (1996). *Patient education: a practical approach*. (2nd. ed.). Thousand Oaks, Calif.: Sage Pubs.
- Manninen, V., Tenkanen, L., Koskinen, P., Huttunen, J., Mäntäri, M., Heinonen, O., & Frick, M. (1992). Joint effects of serum triglyceride and LDL cholesterol and HDL cholesterol concentrations on coronary heart disease risk in the Helsinki Heart Study. Implications for treatment. *Circulation*, *85*(1), 37-45.
- Marckmann, P., & Gronbaek, M. (1999). Fish consumption and coronary heart disease mortality. A systematic review of prospective cohort studies. *Eur J Clin Nutr*, *53*(8), 585-590.
- Markus, R., Mack, W., Azen, S., & Hodis, H. (1997). Influence of lifestyle modification on atherosclerotic progression determined by ultrasonographic change in the common carotid intima-media thickness. *Am J Clin Nutr*, *65*, 1000-1004.
- Mathur, S. (Ed.). (2002). *Epidemic of coronary heart disease and its treatment in Australia*. (Vol. 20). Canberra: Australian Institute of Health and Welfare.
- Mattson, F., & Grundy, S. (1985). Comparison of the effects of saturated, monounsaturated and polyunsaturated fatty acids on plasma lipids and lipoproteins in man. *J Lipid Res*, *26*(194-202).
- McAlister, F., Lawson, F., Koon, T., & Armstrong, P. (2001). Randomised trials of secondary prevention programmes in coronary heart disease: systematic review. *BMJ*, *323*, 957-962.
- McCann, B., Bovbjerg, V., Curry, S., Retzlaff, B., Walden, C., & Knopp, R. (1996). Predicting participation in a dietary intervention to lower cholesterol among individuals with hyperlipidemia. *Health Psychol*, *15*(1), 61-64.
- McCann, B., Retzlaff, B., Dowdy, A., Walden, C., & Knopp, R. (1990). Promoting adherence to low-fat, low-cholesterol diets: review and recommendations. *J Amer Diet Assoc*, *90*(10), 1408-1414, 1417.

- McConnell, T., Laubach, C., & Szmedra, L. (1997). Age and gender related trends in body composition, lipids and exercise capacity during cardiac rehabilitation. *Am J Geriatr Cardiol*, 6(4), 37-45.
- McConnell, T., Palm, R., Shearn, W., & Laubach, C. (1999). Body fat distribution's impact on physiologic outcomes during cardiac rehabilitation. *J Cardiopulm Rehabil*, 19(3), 162-169.
- McDonnell, G., Roberts, D., & Lee, C. (1998). Stages of change and reduction of dietary fat: effect of knowledge and attitudes in an Australian university population. *J Nutr Educ*, 30(1), 37-43.
- McElduff, P., & Dobson, A. (1997). How much alcohol and how often? Population based case-control study of alcohol consumption and risk of a major coronary event. *BMJ*, 315, 1159-1164.
- McGee, H., & Horgan, J. (1992). Cardiac rehabilitation programmes: are women less likely to attend? *BMJ*, 305, 283-284.
- McNamara, D. (1995). Dietary cholesterol and the optimal diet for reducing risk of atherosclerosis. *Can J Cardiol*, 11(Suppl G), 123-126.
- Merritt, S. (1991). Learning style preferences of coronary artery disease patients. *Cardiovasc Nurs*, 27(2), 7-11.
- Microsoft Corporation. (1985-96). Excel 97 (Version 1997): Microsoft Corporation.
- Midgley, J., Matthew, A., Greenwood, C., & Logan, A. (1996). Effect of reduced dietary sodium on blood pressure: a meta-analysis of randomized controlled trials. *JAMA*, 275, 1590-1597.
- Miller, G. (1992). Hemostasis and cardiovascular risk. The British and European experience. *Arch Pathol Lab Med*, 116, 1318-1321.
- Miller, N., & Taylor, C. (1995). Behaviour modification for cardiovascular risk factor reduction. In M. Pollock & D. Schmidt (Eds.), *Heart Disease and Rehabilitation*. Champaign: Human Kinetics.
- Miller, P., Wikoff, R., Garrett, M., McMahan, M., & Smith, T. (1990). Regimen compliance two years after myocardial infarction. *Nurs Res*, 39(6), 333-336.
- Miller, P., Wikoff, R., McMahan, M., Garrett, M., Ringel, K., Collura, D., Siniscalchi, K., Sommer, S., & Welsh, N. (1989). Personal adjustments and regimen compliance 1 year after myocardial infarction. *Heart Lung*, 18(4), 339-346.
- Mitropoulos, K., Miller, G., Marting, J., Reeves, B., & Cooper, J. (1994). Dietary fat induces changes in factor VII coagulant activity through effects on plasma free stearic acid concentrations. *Arterioscl Thromb*, 14, 214-222.
- Moore, S. (1996). Women's views of cardiac rehabilitation programs. *J Cardiopulm Rehabil*, 16(2), 123-129.
- Moore, S., & Kramer, F. (1996). Women's and men's preferences for cardiac rehabilitation program features. *J Cardiopulm Rehabil*, 16(3), 163-168.
- Mori, T., Vandongen, R., Beilin, L., Burke, V., Morris, J., & Ritchie, J. (1994). Effects of varying dietary fat, fish and fish oils on blood lipids in a randomised controlled trial in men at risk of heart disease. *Am J Clin Nutr*, 59(5), 1060-1068.
- Mullen, P., Mains, D., & Velez, R. (1992). A meta-analysis of controlled trials of cardiac patient education. *Patient Educ Counsel*, 19, 143-162.
- Munro, B. (2001). *Statistical Methods for Health Care Research*. Philadelphia: Lippincott.

- Murray, P. (1989). Rehabilitation information and health beliefs in the post-coronary patient: do we meet their information needs? *J Adv Nurs*, 14, 686-693.
- Naslund, G., Fredrikson, M., Hellenius, M., & de Faire, U. (1996). Determinants of compliance in men enrolled in a diet and exercise intervention trial: a randomised, controlled study. *Patient Educ Counsel*, 29, 247-256.
- National Cardiac Rehabilitation Advisory Committee of the Heart Foundation of Australia. (1998). *Recommendations for cardiac rehabilitation*. Canberra: National Heart Foundation of Australia.
- National Health and Medical Research Council. (2000). *How to use the evidence: assessment and application of scientific evidence*. Canberra: Commonwealth of Australia.
- National Health Goals and Targets Implementation Working Group on CVD. (1994). *National goals, targets and strategies for improving cardiovascular health*. Canberra.: Dept Hum Services & Health.
- National Heart Foundation. (1993). *How to plan a cardiac rehabilitation program*. Canberra: NHF.
- National Heart Foundation of Australia. (1997). *Directory of cardiac rehabilitation programs in Victoria*. Melbourne: NHF.
- National Heart Foundation of Australia. (1999). A review of the relationship between dietary fat and cardiovascular disease. *Aust J Nutr Diet*, 56(4) (Suppl), S3-S4.
- Neaton, J., Blackburn, H., Jacobs, D., & "et al". (1992). Serum cholesterol level and mortality: findings for men screened in the Multiple Risk Factor Intervention Trial. *Arch Intern Med*, 152, 1490-1500.
- Neaton, J., & Wentworth, D. (1992). Serum cholesterol, blood pressure, cigarette smoking, and death from coronary heart disease. Overall findings and differences by age for 316099 white men. *Arch Intern Med*, 152, 56-64.
- Newens, A., McColl, E., & Bond, S. (1997). Changes in reported dietary habits and exercise levels after an uncomplicated first myocardial infarction in middle-aged men. *J Clin Nurs*, 6(2), 153-160.
- Nguyen, M., Otis, J., & Potvin, L. (1996). Determinants of intention to adopt a low-fat diet in men 30 to 60 years old: implications for heart health promotion. *Am J Health Promot*, 10(3), 201-207.
- NHMRC Expert Panel on Prevention of Obesity. (1997). *Acting on Australia's weight: a strategic plan for the prevention of overweight and obesity*. Canberra: National Health and Medical Research Council.
- Niebauer, J., Hambrecht, R., Velich, T., Hauer, K., Marburger, C., Kalberer, B., Weiss, C., von Hodenberg, E., Schlierf, G., Schuler, G., Zimmerman, R., & Kubler, W. (1997). Attenuated progression of coronary artery disease after 6 years of multifactorial risk factor intervention: role of physical exercise. *Circulation*, 98(8), 2534-2541.
- Nordly, A., Binaa, K., & Nilsen, H. (1998). Effects of simvastatin and omega-3 fatty acids on plasma lipoproteins and lipid peroxidation in patients with combined hyperlipidaemia. *J Intern Med*, 243, 163-170.
- Nunnally, J. (1978). *Psychometric theory*. (2nd. ed.). New York: McGraw Hill.



- O'Connor, G., Buring, J., Yusuf, S., Goldhaber, S., Olmstead, E., Paffenbarger, R., & Hennekens, C. (1989). An overview of randomised trials of rehabilitation with exercise after myocardial infarction. *Circulation*, *80*, 234-244.
- Oldenburg, B., Martin, A., Greenwood, J., Bernstein, L., & Allan, R. (1995). A controlled trial of a behavioral and educational intervention following coronary artery bypass surgery. *J Cardiopulm Rehabil*, *15*(1), 39-46.
- Oldridge, N., Guyatt, G., Fischer, M., & Rimm, A. (1988). Cardiac rehabilitation after myocardial infarction: combined experience of randomised clinical trials. *JAMA*, *260*, 945-950.
- Oldridge, N., & Streiner, D. (1990). Health belief model as a predictor of compliance with cardiac rehabilitation. *Med Sci Sports Exerc*, *22*, 678-683.
- Oldroyd, J., Unwin, N., White, M., Imrie, K., Mathers, J., & Alberti, K. (2001). Randomised controlled trial evaluating the effectiveness of behavioural interventions to modify cardiovascular risk factors in men and women with impaired glucose tolerance: outcomes at 6 months. *Diabetes Res Clin Pract*, *52*(1), 29-43.
- Oliver, M. S. (1997). It is more important to increase the intake of unsaturated fats than to decrease the intake of saturated fats: evidence from clinical trials relating to ischemic heart disease. *Am J Clin Nutr*, *66*(Suppl), 980S-986S.
- Ornish, D., Brown, S., Scherwitz, L., Billings, J., Armstrong, W., Ports, T., McLanahan, S., Kirkeeide, R., Brand, R., & Gould, K. (1990). Can lifestyle changes reverse coronary heart disease? The lifestyle heart trial. *Lancet*, *336*, 129-133.
- Ounpuu, S., Woolcott, D., & Green, G. (2000). Defining stage of change for lower-fat eating. *J Am Diet Assoc*, *100*(6), 674-679.
- Padberg, R., & Padberg, L. (1990). Strengthening the effectiveness of patient education: applying principles of adult education. *Oncol Nurs Forum*, *17*, 65-69.
- Paisley, C., Lloyd, H., Brown, W., & Mela, D. (1996). Production and validation of a food frequency questionnaire to estimate dietary fat intake. *J Hum Nutr Diet*, *9*, 189-206.
- Paisley, C., Lloyd, H., Sparks, P., & Mela, D. (1995). Consumer perceptions of dietary changes for reducing fat intake. *Nutr Res*, *15*, 1755-1766.
- Paramo, J., Olvide, I., Barba, J., Montes, R., Panizo, C., Munoz, M., & Rocha, E. (1998). Long-term cardiac rehabilitation program favorably influences fibrinolysis and lipid concentrations in acute myocardial infarction. *Haematologica*, *83*(6), 519-524.
- Pearson, T., LaCava, J., & Weil, H. (1997). Epidemiology of thrombotic-hemostatic factors and their associations with cardiovascular disease. *Am J Clin Nutr*, *65*(Suppl), 1674S-1682S.
- Petrie, K., Weinman, J., Sharpe, N., & Buckley, J. (1996). Role of patients' view of their illness in predicting return to work and functioning after myocardial infarction: longitudinal study. *BMJ*, *312*, 1191-1194.
- Povey, R., Connor, M., Sparks, P., James, R., & Shepherd, R. (1999). A critical examination of the application of the Transtheoretical Model's stages of change to dietary behaviours. *Health Educ Res*, *14*(5), 641-651.

- PRECOR Group. (1991). Comparison of a rehabilitation programme, a counselling programme and usual care after an acute myocardial infarction: results of a long-term randomized trial: P.R.E.C.O.R. Group. *Eur Heart J*, 12, 612-616.
- Prochaska, J., & DiClemente, C. (1982). Transtheoretical therapy: toward a more integrative model of change. *Psychotherapy: Theory, Research and Practice*, 19, 276-288.
- Read, G. (1994). *Tools for the assessment of dietary fat intake: a pilot study in cardiac rehabilitation programs*. Unpublished Unpublished, Deakin University, Melbourne.
- Reid, V., & Mulcahy, R. (1987). Nutrient intakes and dietary compliance in cardiac patients: 6-year follow-up. *Hum Nutr: App Nutr*, 41A, 311-318.
- Rhodes, K., Bookstein, L., Aaronson, L., Mercer, N., & Orringer, C. (1996). Intensive nutrition counseling enhances outcomes of National Cholesterol Education Program dietary therapy. *J Am Diet Assoc*, 96, 1003-1010.
- Robinson, P., & McBurney, H. (1993). *Victorian cardiac rehabilitation questionnaire*. Melbourne: National Heart Foundation, Victorian Division.
- Robson, C. (1993). *Real world research*. Oxford, UK: Blackwell.
- Rosenstock, I. (1974). The health belief model and preventive health behaviour. *Health Education Monographs*, 2, 354-386.
- Ruberman, W., Weinblatt, E., Goldberg, J., & Chaudhary, B. (1984). Psychosocial influences on mortality after myocardial infarction. *N Engl J Med*, 311, 552-559.
- Runyon, R., Haber, A., Pittenger, D., & Coleman, K. (1996). *Fundamentals of behavioral statistics*. Boston: McGraw Hill.
- Ruppert, S. (1993). Commentary on informational needs and preferred time to receive information for phase 2 cardiac rehabilitation patients: what CE instructors need to know. *AACN Nurs Scan Crit Care*, 3(4), 8.
- Rushworth, R., Plant, A., Pierce, J., Bauman, A., Aldrich, R., & Cripps, A. (1990). The awareness of the risk of elevated cholesterol levels and knowledge about cholesterol-lowering action in Australia. *MJA*, 152(2), 72-75.
- Saba, A., Vassallo, M., & Turrini, A. (2000). The role of attitudes, intentions and habit in predicting actual consumption of fat containing foods in Italy. *Eur J Clin Nutr*, 54(7), 540-545.
- Savage, P., Lee, M., Harvey-Berino, J., Brochu, M., & Ades, P. (2002). Weight reduction in the cardiac rehabilitation setting. *J Cardiopulm Rehabil*, 22(3), 154-60.
- Scalzi, C., Burke, L., & Greenland, S. (1980). Evaluation of an inpatient educational program for coronary patients. *Heart Lung*, 9, 846.
- Schuler, G., Hambrecht, R., Schlierf, G., Niebauer, J., Hauer, K., Neumann, J., Hoberg, E., Drinkmann, A., Bacher, F., & Grunze, M. (1992). Regular physical exercise and low-fat diet: effects on progression of coronary artery disease. *Circulation*, 86(1), 1-11.
- Schulz, D., & McBurney, H. (2000). Factors which influence attendance at a rural Australian cardiac rehabilitation program. *Coron Health Care*, 4(3), 135-141.
- Shepherd, R. (Ed.). (1987). *The effects of nutritional beliefs and values on food acceptance*. London: Academic Press.

- Shepherd, R. (Ed.). (1989). *Factors influencing food preferences and choice*. Chichester: Wiley.
- Shepherd, R., & Stockley, L. (1987). Nutrition knowledge, attitudes and fat consumption. *J Amer Diet Assoc*, 87, 615-619.
- Shepherd, R., & Towler, G. (1992). Nutrition knowledge, attitudes and fat intake: application of the theory of reasoned action. *J Hum Nutr Diet*, 5, 387-397.
- Shrapnel, W., Calvert, G., Nestel, P., & Truswell, A. (1992). Diet and coronary heart disease: the National Heart Foundation of Australia. *MJA*, 156(Suppl), S9-S16.
- Singh, R., Rastogi, S., Verma, R., Laxmi, B., Singh, R., Ghosh, S., & Niaz, M. (1992). Randomised controlled trial of cardioprotective diet in patients with recent acute myocardial infarction: results of one year follow up. *BMJ*, 304(18 Apr), 1015-1019.
- Siscovick, D., Raghunathan, T., King, I., & et al. (1995). Dietary intake and cell membrane levels of long-chain n-3 polyunsaturated fatty acids and the risk of primary cardiac arrest. *JAMA*, 27, 756-761.
- Sivarajan, E., Newton, K., Almes, M., Kempf, T., Mansfield, L., & Bruce, R. (1983). Limited effects of outpatient teaching and counselling after myocardial infarction: a controlled study. *Heart Lung*, 12, 65-73.
- Slyper, A. (1994). Low density lipoprotein density and atherosclerosis. *JAMA*, 272(4), 305-308.
- Smith, A., & Owen, N. (1992). Associations of social status and health related beliefs with dietary fat and fibre densities. *Prev Med*, 21, 735-745.
- Smith, J., & Lopez, L. (1991). An application of theory and its relationship to program effectiveness in nutrition education research. *J Nutr Ed*, 23, 59-64.
- Smith, S., Blair, S., Bonow, R., Brass, L., M, C., Dracup, K., Fister, V., & al, e. (2001). AHA/ACC guidelines for preventing heart attack and death in patients with atherosclerotic cardiovascular disease: 2001 update. *Circulation*, 104, 1577-1579.
- SPSS. (1998). SPSS for Windows (Version 8.0). Chicago, IL: SPSS Inc.
- Stafleu, A., de Graaf, C., & van Staveren, W. (1994). Attitudes towards high-fat foods and their low-fat alternatives: reliability and relationship with fat intake. *Appetite*, 22, 183-196.
- Stamler, J., Wentworth, D., & Neaton, J. (1986). Is relationship between serum cholesterol and risk of premature death from coronary heart disease continuous and graded? Findings in 356,222 primary screenees of the Multiple Risk Factor Intervention Trial (MRFIT). *JAMA*, 28, 2823-2828.
- Steinberg, D., Parthasarathy, S., Carew, T., Khoo, J., & Witztum, J. (1989). Beyond cholesterol: modifications of low-density lipoprotein that increase its atherogenicity. *N Eng J Med*, 320, 915-924.
- Steptoe, A., Doherty, S., Kerry, S., Rink, E., & Hilton, S. (2000). Sociodemographic and psychological predictors of changes in dietary fat consumption in adults with high blood cholesterol following dietary counselling. *Health Psychol*, 19(5), 411-419.
- Steptoe, A., Kerry, S., Rink, E., & Hilton, S. (2001). The impact of behavioral counseling on stage of change in fat intake, physical activity, and cigarette smoking in adults at increased risk of coronary heart disease. *Am J Pub Health*, 91(2), 265-269.

- Steptoe, A., Wijetunge, S., Doherty, S., & Wardle, J. (1996). Stages of change for dietary fat reduction: associations with food intake, decisional balance and motives for food choice. *Health Educ J*, 55, 108-122.
- Stone, N., Nicolosi, R., Kris-Etherton, P., Ernst, N., Krauss, R., & Winston, M. (1996). Summary of the scientific conference on the efficacy of hypocholesterolemic dietary interventions. *Circulation*, 94, 3388-3391.
- Storlie, F. (1981). The patient as colleague: a personal philosophy. *Rehabil Nurs*, Jul/Aug, 16-22.
- Strecher, V., DeVellis, B., Rosenstock, M., & Rosenstock, I. (1986). The role of self-efficacy in achieving health behaviour change. *Health Educ Q*, 13, 73-92.
- Streiner, D., & Norman, G. (1992). *Health measurement scales: a practical guide to their development and use*. Oxford: Oxford University Press.
- Sytkowski, P., D'Agostino, R., Belanger, A., & Kannel, W. (1996). Sex and time trends in cardiovascular disease incidence and mortality: the Framingham Heart study 1950-1989. *Am J Epidemiol*, 143, 338-350.
- Tardivel, J. (1998). Gender differences in relation to motivation and compliance in cardiac rehabilitation. *Nurs Crit Care*, 3(5), 214-219.
- Terry, R., Oakland, M., & Ankeny, K. (1991). Factors associated with adoption of dietary behaviour to reduce heart disease risk among males. *J Nutr Educ*, 23(4), 154-160.
- Thornhill, M., & Stevens, J. (1998). Client perceptions of a rural-based cardiac rehabilitation program: a grounded theory approach. *Australian Journal of Rural Health*, 6(2), 105-111.
- Tilvis, R., & Miettinen, T. (1986). Serum plant sterols and their relation to cholesterol absorption. *Am J Clin Nutr*, 43, 92-97.
- Timlin, M., Shores, K., & Reicks, M. (2002). Behaviour change outcomes in an outpatient cardiac rehabilitation program. *J Am Diet Assoc*, 102(5), 664-671.
- Travers, K., Tan, M., MacCleave, A., Murphy, A., & Whiting, S. (1992). Evaluation of a motivational education program for cardiovascular risk reduction: effects on knowledge and behaviour. *J Nutr Educ*, 24(3), 109-116.
- Trent, L. (1992). Nutrition knowledge of active-duty navy personnel. *J Amer Diet Assoc*, 92, 724-728.
- Truswell, A. (1994). Review of dietary intervention studies: effect on coronary events and on total mortality. *Aust N Z J Med*, 24(1), 98-106.
- Turner, S., Bethell, H., Evans, J., Goddard, J., & Mullee, M. (2002). Patient characteristics and outcomes of cardiac rehabilitation. *J Cardiopulm Rehabil*, 22(4), 253-260.
- Turrell, G. (1997). Educational differences in dietary guideline food practices: are they associated with educational differences in food and nutrition knowledge? *Aust J Nutr Diet*, 54(25-33).
- Ubbink, J., van der Merwe, A., Vermaak, W., & Delpport, R. (1993). Vitamin B12, vitamin B6 and folate nutritional status in men with hyperhomocysteinemia. *Am J Clin Nutr*, 57, 47-53.
- Van Buerden, E., James, R., Christian, J., & Church, D. (1991). Dietary self-efficacy in a community-based intervention: implications for effective dietary counselling. *Aust J Nutr Diet*, 48(2), 64-67.

- van der Veen, J., Bakx, C., van den Hoogen, H., Verheijden, M., van den Bosch, W., van Weel, C., & van staveren, W. (2002). Stage-matched nutrition guidance for patients at elevated risk of cardiovascular disease: a randomized intervention study in family practice. *J Fam Pract*, 51(9), 751-758.
- Van Horn, L., Dolecek, T., Grandits, G., & Skweres, L. (1997). Adherence to dietary recommendations in the special intervention group in the Multiple Risk Factor Intervention Trial. *Am J Clin Nutr*, 65(Suppl), 289S-304S.
- Van-Elderen-van-Kemenade, T., Maes, S., & Van-den-Broek, Y. (1994). Effects of a health education program with telephone follow-up during cardiac rehabilitation. *Br J Clin Psych*, 33(3), 367-378.
- Verschuren, M., Jacobs, D., Bloemberg, B., Kromhout, D., & Menotti, A. (1995). Serum total cholesterol and long-term coronary heart disease mortality in different cultures. 25-year follow-up of the Seven Countries Study. *JAMA*, 274, 131-136.
- Visioli, F., & Galli, C. (2001). Antiatherogenic components of olive oil. *Curr Atheroscler Rep*, 3(1), 64-67.
- Vollset, S., Refsum, H., Tverdal, A., Nygars, O., Nordrehaug, J., Tell, G., & Ueland, P. (2001). Plasma total homocysteine and cardiovascular and noncardiovascular mortality: the Hordaland Homocysteine Study. *Am J Clin Nutr*, 74, 130-136.
- von Schacky, C., Angerer, P., Kothny, W., Theisen, K., & Mudra, H. (1999). The effect of dietary omega-3 fatty acids on coronary atherosclerosis - a randomised, double-blind, placebo-controlled trial. *Ann Intern Med*, 130, 554-562.
- Wagner, E., & Williams, R. (Eds.). (1987). *Rehabilitation after myocardial infarction*. St Louis: C.V. Mosby.
- Wardle, J., Parmenter, K., & Waller, J. (2000). Nutrition knowledge and food intake. *Appetite*, 34, 269-275.
- Warner, J., Brubaker, P., Zhu, Y., Morgan, T., Ribisl, T., Miler, H., & Herrington, D. (1995). Long-term (5-year) changes in HDL cholesterol in cardiac rehabilitation patients. Do sex differences exist? *Circulation*, 92(4), 773-777.
- Watts, G., Jackson, P., Burke, V., & Lewis, B. (1996). Dietary fatty acids and progression of coronary artery disease in men. *Am J Clin Nutr*, 64, 202-209.
- Watts, G., Lewis, B., Brunt, J., Lewis, E., Coltart, D., Smith, L., Mann, J., & Swan, A. (1992). Effects on coronary artery disease of lipid-lowering diet, or diet plus cholestyramine, in the St Thomas' Atherosclerosis Regression Study (STARS). *Lancet*, 339(8793), 563-569.
- Welkowitz, J., Ewen, R., & Cohen, J. (1982). *Introductory statistics for the behavioral sciences*. (Third ed.). Orlando: Harcourt Brace Jovanovich.
- Williams, P. (2001). Physical fitness and activity as separate heart disease risk factors: a meta-analysis. *Med Sci Sports Exerc*, 33(5), 762-764.
- Wilson, P., D'Agostino, R., Sullivan, L., Parise, H., & Kannel, W. (2002). Overweight and obesity as determinants of cardiovascular risk: the Framingham experience. *Arch Intern Med*, 162(16), 1867-1872.
- Windsor, R., Baranowski, T., Clark, N., & Cutter, G. (1994). *Evaluation of health promotion, health education and disease prevention programs*. (2nd. Ed.). Mount. View: Mayfield Pub Co.

- Winniford, M. (1990). Smoking and cardiovascular function. *J Hyperten*, 9(Suppl), 254L-259L.
- Woodward, D., Cumming, F., & Ball, P. (1995). What sort of person claims to be on a cholesterol-lowering diet? *Proc Nutr Soc Aust*, 19, 121.
- Worcester, M. (1986). *Cardiac rehabilitation programs in Australian hospitals*. Canberra: NHF.
- World Health Organisation. (1993). *Rehabilitation and comprehensive secondary prevention after acute myocardial infarction* (Euro Report 84). Copenhagen: WHO.
- Wright, C. (1994). Preliminary survey of attitudes to, and factors affecting, perceived success or failure among adults attending a hospital lipid clinic. *J Hum Nutr Diet*, 7, 153-159.
- Yu-Poth, S., Zhao, G., Etherton, T., Naglak, M., Jonnalagadda, S., & Kris-Etherton, P. (1999). Effects of the National Cholesterol Education Program's Step I and Step II dietary intervention programs on cardiovascular disease risk factors: a meta-analysis. *Am J Clin Nutr*, 69, 632-646.

# Appendix 1

## Part 1 Observation Report

CRP PHASE 2 OBSERVATION RECORD Date \_\_\_\_\_ Time \_\_\_\_\_

Hospital/Health Centre Name \_\_\_\_\_

Code No. \_\_\_\_\_ Nutrition facilitator \_\_\_\_\_

Discipline of nutrition facilitator \_\_\_\_\_

**Participants**

1. **Number attending** Total \_\_\_\_\_ Patients \_\_\_\_\_ Friends/relatives \_\_\_\_\_

2. **Patients' gender**  Male  Female

3. **Friends/relatives' gender**  Male  Female

4. **Age**  over 50  under 50

5. **Ethnic origin**  Asian  Mediterranean  Northern European  
 Other \_\_\_\_\_

6. **English language skills**

Excellent  Good  Average  Poor  Very poor

7. **Weight**  Overweight  Normal weight

8. **Types of heart disorder**

Myocardial infarction  Coronary bypass  Angioplasty

Other \_\_\_\_\_



9. **Stage of attendance**      First       Subsequent       Final

10. **Attitude**

Very interested       Interested       Average

Disinterested       Very disinterested

11. **Level of understanding**

Excellent       Good       Average       Poor       Very poor

12. **Level of involvement**

Excellent       Good       Average       Poor       Very poor

13. **Atmosphere**

Very relaxed       Relaxed       Average       Tense       Very tense

**Nutrition educator**

14. **Main topic** \_\_\_\_\_  
\_\_\_\_\_

15. **Other topics** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

16. **Education techniques used**

Lectures       Group discussions       Practical tasks

Other \_\_\_\_\_

**17. Education resources used**

- |                          |                    |                          |                 |
|--------------------------|--------------------|--------------------------|-----------------|
| <input type="checkbox"/> | Whiteboard         | <input type="checkbox"/> | TV/video        |
| <input type="checkbox"/> | Overhead projector | <input type="checkbox"/> | Slide projector |
| <input type="checkbox"/> | Food products      |                          |                 |
| <input type="checkbox"/> | Handout material   |                          |                 |
- 

Other \_\_\_\_\_

**18. Quality of information**

Excellent       Good       Average       Poor       Very poor

**19. Clarity of presentation**

Excellent       Good       Average       Poor       Very poor

**20. Quality of preparation**

Excellent       Good       Average       Poor       Very poor

**21. Handling of questions**

Excellent       Good       Average       Poor       Very poor

**22. Rapport with participants**

Excellent       Good       Average       Poor       Very poor

**Comments** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## Appendix 2

### Part 1 Cardiac Rehabilitation Program

#### Outpatient Nutrition Questionnaire

**HEART FOUNDATION/DEAKIN UNIVERSITY  
CARDIAC REHABILITATION PROGRAM PHASE 2 (OUTPATIENT)  
NUTRITION QUESTIONNAIRE**

Please return to: Mr. S. Bunker, Cardiac Rehabilitation Manager,  
Heart Foundation, Victorian Division,  
411 King St., West Melbourne. 3003.  
(Postage-paid addressed envelope enclosed for your convenience)

1. Hospital/Health Centre name \_\_\_\_\_

Address \_\_\_\_\_

Telephone no. \_\_\_\_\_ Fax no. \_\_\_\_\_

2. Name of person completing the questionnaire \_\_\_\_\_

3. Discipline of person completing questionnaire (eg. dietitian, nurse etc)  
\_\_\_\_\_

4. Please describe the format of your **phase 2 CRP**, as follows. (Please write in the box provided)

- |    |  |                              |
|----|--|------------------------------|
| a. | Length of your phase 2 CRP (number of weeks)                                 | <input type="checkbox"/>     |
| b. | Number of sessions per program per week                                      | <input type="checkbox"/>     |
| c. | Number of hours for each session (total hours - exercise and education)      | <input type="checkbox"/>     |
| d. | Number of programs run in a year   | <input type="checkbox"/>     |
| e. | Average number of participants in each program (including friends/relatives) | <input type="checkbox"/>     |
| f. | Is a nutrition component included in your program? (Please tick a box)       | Yes <input type="checkbox"/> |
|    |  | No <input type="checkbox"/>  |

**If 'No' to question 4 (f), please return this questionnaire to the address above in the envelope provided. If 'Yes' to question 4 (f), please complete this questionnaire.**

5. Please describe the format of the **nutrition component** of your program, as follows.  
(Please write in the box provided)

- |    |  |                          |
|----|--|--------------------------|
| a. | Number of nutrition sessions per program             | <input type="checkbox"/> |
| b. | Duration of each nutrition session (number of hours) | <input type="checkbox"/> |

6. What is the name of the nutrition facilitator? \_\_\_\_\_

7. What are the qualifications of the nutrition facilitator?  
\_\_\_\_\_

PTO

8. a. Do you have aims and objectives for the nutrition component of your program?

(Please tick a box)  Yes  No Please comment \_\_\_\_\_

\_\_\_\_\_

b. If 'Yes', are these aims and objectives documented? (Please tick a box)

Yes  No Please comment \_\_\_\_\_

\_\_\_\_\_

9. a. If 'Yes' to question 8, what are the nutrition aims?

\_\_\_\_\_

\_\_\_\_\_

b. If 'Yes' to question 8, what are the nutrition objectives?

\_\_\_\_\_

\_\_\_\_\_

10. Please list the topics covered in the nutrition component (eg dietary fat, food labels, recipes).

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

11. What education techniques are used in the nutrition component? (Please tick one or more boxes)

Lectures  Group discussions  Practical tasks

Other (Please specify) \_\_\_\_\_

\_\_\_\_\_

12. What resources are used in the nutrition component? (Please tick one or more boxes)

- Whiteboard
  - Overhead projector
  - Slide projector
  - TV/video
  - Food products
  - Handout material (Please specify) \_\_\_\_\_
- 
- 

Other (Please specify) \_\_\_\_\_

---

---

13. How are participants with English language difficulties catered for?

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14. Is the nutrition component of your program evaluated? (Please tick a box)  Yes  No

If 'Yes', which methods are used? (Please tick one or more boxes)

- Questionnaire (post-session)
  - Questionnaires (pre- and post session)
  - Group feedback
  - Individual feedback
  - Telephone follow-up
  - Other (Please specify) \_\_\_\_\_
- 
- 
- 

PTO

15. In your opinion, would your participants like more time spent on the nutrition component of the program?

(Please tick a box)

Yes  No

Please comment \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

16. Are there any barriers to the delivery of the nutrition component of your program? (If 'Yes', please describe)

\_\_\_\_\_

\_\_\_\_\_

17. How could the Heart Foundation assist you in the planning and delivery of the nutrition component (eg additional resources)? (Please tick one or more boxes)

- Professional papers
- Patient literature
- Guidelines for program planning
- Evaluation instruments
- Additional resources (eg videos) (Please specify) \_\_\_\_\_

\_\_\_\_\_

Other (Please specify) \_\_\_\_\_

\_\_\_\_\_

18. General comments on the nutrition component of your program.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

### THANK YOU

Your co-operation in filling in and returning this questionnaire is much appreciated.

It would be helpful if you could include copies of any printed material used in the planning and delivery of the nutrition education component of your program.

**Appendix 3**  
**Plain Language Statements**



**DEAKIN UNIVERSITY  
ETHICS COMMITTEE  
PLAIN LANGUAGE STATEMENT**

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**Project Title: An investigation of nutrition education in outpatient cardiac rehabilitation programs.**

My name is Fay Paxton and I am enrolled in a Master of Human Nutrition course at Deakin University. As part of this course, I am undertaking a research project under the supervision of Professor Madeleine Ball and the Heart Foundation's staff Steve Bunker and Cathy Cooper. This project is to find out if your attendance at a cardiac rehabilitation program changes your nutrition knowledge, attitudes and eating behaviour and is helpful to you.

I would like to invite you to participate in this research project. This will involve completing a questionnaire on three separate occasions while you are attending your cardiac rehabilitation program. The first questionnaire will take 20 minutes, the second 15 minutes and the third 5 minutes. Two questionnaires are on nutrition knowledge, attitudes and food intake. The first of these questionnaires will also ask for background information such as age, education level, type of heart disease etc. The rest of the questions, see samples below, require mainly 'tick the box' type answers:

(If you think the statement is correct, please tick the box)

Butter is high in fat.

Healthy foods are more expensive to buy (Please tick the box that is most applicable to you)

- |                          |                   |
|--------------------------|-------------------|
| <input type="checkbox"/> | Strongly disagree |
| <input type="checkbox"/> | Disagree          |
| <input type="checkbox"/> | Undecided         |
| <input type="checkbox"/> | Agree             |
| <input type="checkbox"/> | Strongly agree    |

A third anonymous questionnaire will ask how satisfied you were with the nutrition education session(s) and most questions are in a similar 'tick the box' format.

Your participation in this project would very helpful and much appreciated but you are not under any obligation to do so. If you do participate in the project, you are free to withdraw at any time. This will not affect your attendance at the cardiac rehabilitation program in any way.

A summary of my findings will be given to the hospital and will be available on written request.

If you are willing to participate, please read and sign the accompanying form and return it to Fay Paxton at this or your next cardiac rehabilitation session.

If you have any queries, please contact:

**Student researcher:** Fay Paxton - contact Steve Bunker/Cathy Cooper, Heart Foundation 9329 8511.

**Supervisor:** Professor Madeleine Ball, School of Nutrition and Public Health. Tel: 9244 5341.

**DEAKIN UNIVERSITY ETHICS COMMITTEE  
PLAIN LANGUAGE STATEMENT**

**Project Title:** A follow-up investigation of nutrition education in Phase 2 (outpatient) Cardiac Rehabilitation Programs.

My name is Fiona Dunn and I am enrolled in the Master of Human Nutrition course at Deakin University. As part of the course, I am undertaking a research project under the supervision of Professor Madeleine Ball and the Heart Foundation. This project is a follow-up of the study performed by Fay Paxton and will look at your diet now and any changes since you took part in the Cardiac Rehabilitation Program.

I would like to invite you to participate in this Research project. It will involve you completing two questionnaires: the first one will take approximately 30 minutes and the second will take about 15 minutes. Your height and weight will also be measured, and finally a few short questions will be asked on changes you have made or problems encountered since the Cardiac Rehabilitation Program and whether you have experienced further Heart Problems. The questionnaires, see **examples** below, require mainly 'tick the box' type answers

**(If you think the statement is correct, please tick the box)**

Butter is high in fat

**(Please tick the box most appropriate to you)**

Healthy foods are more expensive to buy

Strongly Disagree

Disagree

Undecided

Agree

Strongly Agree

Your participation in this project would be very helpful and much appreciated. If you do participate in the project, you are free to withdraw at any time.

A summary of the findings will be available from Deakin University on request.

Should you have any concern about the conduct of this research project, please contact the Chair, Dr Ross King, Deakin University Ethics subcommittee-Health and Behavioural Sciences; ph. 03 52 272781

If you have any further queries, please contact:

**Student researcher:** Fiona Dunn-contact Madeleine Ball 9244 5340 or 9251 7256

**Supervisor:** Professor Madeleine Ball, School of Nutrition & Public Health 9244 5340 or 9251 7256

**Appendix 4**  
**Consent Forms**

DEAKIN UNIVERSITY  
ETHICS COMMITTEE



CONSENT FORM: SURVEYS, QUESTIONNAIRES

---

I,

of

**Hereby consent** to be a subject of a human research study to be undertaken by Fay Paxton, a Deakin University Master of Human Nutrition student, in conjunction with the Heart Foundation, and I understand that the purpose of the research is to investigate the effectiveness of nutrition education in Victorian outpatient cardiac rehabilitation programs (CRPs) in terms of improving participants' nutrition knowledge, attitudes and eating behaviours.

I understand that this will involve filling in a questionnaire on two separate occasions.

**I acknowledge**

1. Upon receipt, my questionnaire will be coded and my name and address kept separately from it.
2. Any information that I provide will not be made public in any forms that could reveal my identity to an outside party ie. that I will remain fully anonymous.
3. I understand that aggregated results will be used for research purposes and may be reported in scientific journals.
4. Individual results **will not** be released to any person except at my request and on my authorisation.
5. That I am free to withdraw my consent at any time during the study in which event my participation in the research study will immediately cease and any information obtained from me will not be used.

Signature:

Date:

.. of

ereby consent to be a subject of a human research study to be undertaken by Fiona Dunn, a Deakin  
niversity Master of Human Nutrition student. I understand that the purpose of the research is to  
investigate my attitudes to food and current diet as part of a follow-up of nutrition education in  
ctorian outpatient cardiac rehabilitation programs (CRP's). I understand that this will involve an  
erview of approximately one hour involving the completion of two questionnaires, answering a few  
ef questions about my diet in addition to height and weight measurements.

**cknowledge that:**

That the aims, methods, and anticipated benefits, and possible hazards of the research study,  
have been explained to me.

That I voluntarily and freely give my consent to my participation in such research study.

I understand that aggregated results **will** be used for research purposes and may be reported  
in scientific journals.

Individual results will not be released to any person.

That I am free to withdraw my Consent at any time during the study, in which event my  
participation in the research study will immediately cease and any information obtained from  
me will not be used.

Signature: ..

Date: .

## Appendix 5

# Part 2 Pulmonary Rehabilitation Nutrition Questionnaire

**HEART FOUNDATION/DEAKIN UNIVERSITY  
NUTRITION QUESTIONNAIRE**

Thank you for agreeing to take part in this study.

**Note:** The information you provide will be strictly confidential and no identification will be used in the analysis and reporting of results.

Please tick a box (✓) or write in the space provided.

**Please tick one box only unless more than one is specified.**

Hospital/health centre \_\_\_\_\_

Date \_\_\_\_\_

1. Name \_\_\_\_\_ 2. Gender  Male  Female

3. Age \_\_\_\_\_ years 4. Height \_\_\_\_\_ 5. Weight \_\_\_\_\_

**6. Living arrangements**

- Living with spouse/partner only
- Living with spouse/partner and family or friends
- Living as single with family or friends
- Living alone
- Other (Please specify) \_\_\_\_\_

**7. Highest education level**

- Primary school
- Secondary school
- Tertiary Certificate/Diploma
- Tertiary Degree
- Tertiary Post-graduate
- Other (Please specify) \_\_\_\_\_

**8. Current employment**

- Employed or self-employed
- Unemployed
- Retired
- Home duties
- Other (Please specify) \_\_\_\_\_

**9. Preferred language spoken at home**

- English
- Italian
- Greek
- Turkish
- Other (Please specify) \_\_\_\_\_

**10. Do you have or have you had any of the following health problems? You may tick more than one box**

- Heart disease or heart surgery
- High blood pressure
- Raised blood cholesterol or blood fats
- Diabetes

**11. Are you on a special diet for... You may tick more than one box**

- Heart disease
- Raised blood cholesterol or blood fats
- High blood pressure
- Diabetes
- Weight loss
- Weight gain
- Other (Please specify) \_\_\_\_\_

Next page please

12. Have you previously attended a.....  
 cardiac rehabilitation program  
 pulmonary rehabilitation program  
 If 'Yes', how long ago....?  
 PRP \_\_\_\_\_ CRP \_\_\_\_\_

13. Do you have difficulty eating because of your breathing problem?  
 No difficulty  
 Slight difficulty  
 Moderate difficulty  
 Severe difficulty

14. Have you ever received nutritional advice from a health professional (such as a doctor, dietitian, nurse, naturopath)?  Yes  No  
 If 'Yes', please specify the profession \_\_\_\_\_

15. Have you obtained nutritional information from any of the following sources?  
 You may tick more than one box

<input type="checkbox"/> Popular magazine	<input type="checkbox"/> Scientific journal
<input type="checkbox"/> Newspaper	<input type="checkbox"/> Radio/television
<input type="checkbox"/> Book	<input type="checkbox"/> Family member
<input type="checkbox"/> Heart Foundation or other medical literature	<input type="checkbox"/> Friend
<input type="checkbox"/> Other (Please specify) _____	

**Nutrition Knowledge Questionnaire**

Some of the following statements are correct and some are incorrect.  
 If you think the statement is correct, please place a tick (✓) in the box.  
 If you think the statement is incorrect, please place a cross (X) in the box.  
 If you are unsure, please leave the box blank.

- |   |                          |
|---|--------------------------|
| 1. Cottage cheese contains more fat than cheddar cheese.                                      | <input type="checkbox"/> |
| 2. Fat-trimmed, lean cuts of meat may contain less than 5% fat.                               | <input type="checkbox"/> |
| 3. The fats found in fish are beneficial in heart disease.                                    | <input type="checkbox"/> |
| 4. Skinny milk contains less than 1% fat.   | <input type="checkbox"/> |
| 5. Saturated fats are more likely to be liquid rather than solid.                             | <input type="checkbox"/> |
| 6. Cholesterol is found in all foods that contain fat or oil.                                 | <input type="checkbox"/> |
| 7. Olive oil contains monounsaturated fats.   | <input type="checkbox"/> |
| 8. Polyunsaturated fats are usually found in vegetable oils like sunflower and safflower oil. | <input type="checkbox"/> |
| 9. A meat pie contains more fat than a loaf of bread.   | <input type="checkbox"/> |
| 10. Rev milk contains the same amount of fat as Skinny milk.                                  | <input type="checkbox"/> |
| 11. Avocados contain cholesterol.   | <input type="checkbox"/> |
| 12. Butter and margarine contain the same amount of fat.                                      | <input type="checkbox"/> |

Next page please



13. Roast potatoes are higher in fat than potato chips.
14. If an oil has been hydrogenated, it has become less saturated.
15. Farmhouse milk has less fat than regular milk.
16. Sausages, frankfurts and salami are high-fat meat products.
17. Toasted muesli is a low-fat breakfast cereal.
18. Nuts contain less fat than kidney beans and lentils.
19. Saturated and polyunsaturated fats have a similar kilojoule (calorie) value.
20. If a food product contains only vegetable oils, it must be low in saturated fat.
21. Seafoods contain polyunsaturated fat.

### Food Attitude Questionnaire

Please read each statement and tick (✓) the box below that is most applicable to you.  
Please tick ONE box only for each question.

1. People who have been eating the same food all their life should not have to change now.

<input type="checkbox"/>	Strongly disagree
<input type="checkbox"/>	Disagree
<input type="checkbox"/>	Undecided
<input type="checkbox"/>	Agree
<input type="checkbox"/>	Strongly agree

2. There will be plenty of time later on to reduce fat and increase fibre in the diet.

<input type="checkbox"/>	Strongly disagree
<input type="checkbox"/>	Disagree
<input type="checkbox"/>	Undecided
<input type="checkbox"/>	Agree
<input type="checkbox"/>	Strongly agree

3. Starting a low fat, high fibre diet now will give benefits to health in the long term.

<input type="checkbox"/>	Strongly disagree
<input type="checkbox"/>	Disagree
<input type="checkbox"/>	Undecided
<input type="checkbox"/>	Agree
<input type="checkbox"/>	Strongly agree

4. Health food is more trouble for the cook and takes longer to prepare.

<input type="checkbox"/>	Strongly disagree
<input type="checkbox"/>	Disagree
<input type="checkbox"/>	Undecided
<input type="checkbox"/>	Agree
<input type="checkbox"/>	Strongly agree

5. Low fat, high fibre food is tasteless and bland.

<input type="checkbox"/>	Strongly disagree
<input type="checkbox"/>	Disagree
<input type="checkbox"/>	Undecided
<input type="checkbox"/>	Agree
<input type="checkbox"/>	Strongly agree

6. Changing to a low-fat, high-fibre diet is too complicated and difficult to do.

<input type="checkbox"/>	Strongly disagree
<input type="checkbox"/>	Disagree
<input type="checkbox"/>	Undecided
<input type="checkbox"/>	Agree
<input type="checkbox"/>	Strongly agree

Next page please

7. **Salads in season make an interesting and tasty meal.**

- Strongly disagree
- Disagree
- Undecided
- Agree
- Strongly agree

8. **Once you are used to eating less fat you don't miss it at all.**

- Strongly disagree
- Disagree
- Undecided
- Agree
- Strongly agree

9. **New diets are easier to start than to keep up.**

- Strongly disagree
- Disagree
- Undecided
- Agree
- Strongly agree

10. **Low-fat milk tastes better than full-cream milk.**

- Strongly disagree
- Disagree
- Undecided
- Agree
- Strongly agree

### Eating Habits Questionnaire

These questions ask about your current eating habits.  
Please place a tick (✓) in the box that is most applicable to you.  
Please tick ONE box only for each question.

1. **How often do you eat fried food with a batter or breadcrumb coating?**

- Never
- Less than once a week
- Once or twice a week
- Three to five times a week
- Six or more times a week

2. **How often do you eat gravy, cream sauces or cheese sauces?**

- Never
- Less than once a week
- Once or twice a week
- Three to five times a week
- Six or more times a week

3. **How often do you add butter, margarine, oil or sour cream to vegetables, cooked rice or spaghetti?**

- Never
- Less than once a week
- Once or twice a week
- Three to five times a week
- Six or more times a week

Next page please.

4. How often do you eat vegetables that are fried or roasted with fat or oil?

- Never
- Less than once a week
- Once or twice a week
- Three to five times a week
- Six or more times a week

5. How is your meat usually cooked?

- Only eat meat occasionally or never
- Grilled or roasted without added oil or fat
- Grilled or roasted with added fat or oil
- Stewed or goulash
- Fried

6. How many times a week do you eat sausages, devon, salami, meat pies, hamburgers or bacon?

- Never
- Less than once a week
- Once or twice a week
- Three to five times a week
- Six or more times a week

7. How do you spread butter/margarine on your bread?

- Don't use butter or margarine
- Thinly
- Thickly

8. How many times a week do you eat chips or French fries?

- Never
- Less than once a week
- Once or twice a week
- Three to five times a week
- Six or more times a week

9. How often do you eat pastries, cakes, sweet biscuits or croissants?

- Never
- Less than once a week
- Once or twice a week
- Three to five times a week
- Six or more times a week

10. How many times a week do you eat chocolate, chocolate biscuits or sweet snack bars?

- Never
- Less than once a week
- Once or twice a week
- Three to five times a week
- Six or more times a week

Next page please

11. **How many times a week do you eat potato crisps, corn chips or nuts?**

- Never
- Less than once a week
- Once or twice a week
- Three to five times a week
- Six or more times a week

12. **How often do you eat cream?**

- Never
- Less than once a week
- Once or twice a week
- Three to five times a week
- Six or more times a week

13. **How often do you eat ice cream?**

- Never
- Less than once a week
- Once or twice a week
- Three to five times a week
- Six or more times a week

14. **How many times a week do you eat cheddar, edam or other hard cheese, cream cheese or cheese like camembert?**

- Never
- Less than once a week
- Once or twice a week
- Three to five times a week
- Six or more times a week

15. **What type of milk do you drink or use in cooking or in tea and coffee?**

- Skim or none
- Reduced fat
- Full cream and reduced fat
- Full cream
- Condensed

16. **How much of the skin on your chicken do you eat?**

(If you never eat chicken, please mark the 'none of the skin' response)

- None of the skin
- Some of the skin
- Most or all of the skin

17. **How much of the fat on your meat do you eat?**

(If you never eat meat, please mark the 'none of the fat' response)

- None of the fat
- Some of the fat
- Most or all of the fat

**Thank you for your cooperation. It is most appreciated.**

## **Appendix 6**

### **Part 2 Pre-test Cardiac Rehabilitation**

#### **Program Nutrition Questionnaire**

**HEART FOUNDATION/DEAKIN UNIVERSITY  
CARDIAC REHABILITATION PROGRAM  
NUTRITION QUESTIONNAIRE**

The Heart Foundation in conjunction with Deakin University is currently trying to find out more about nutrition education in cardiac rehabilitation programs.

Thank you for agreeing to take part in this study.

We would appreciate it if you would take the time to answer the attached questions. You may ask for help if the instructions are unclear but we would like you to answer the questions as best you can on your own.

**Note: As your responses need to be matched up later, we need identification to allow us to do this. However, the information you provide will be strictly confidential and no identification will be used in the analysis and reporting of results.**

Questionnaire no. \_\_\_\_\_ Venue: \_\_\_\_\_ Date: \_\_\_\_\_

**Please tick a box (✓) or write in the space provided.  
Please tick one box only unless more than one is specified.**

1. Name \_\_\_\_\_ 2. Gender  Male  Female

3. Age \_\_\_\_\_ years 4. Height \_\_\_\_\_ cm 5. Weight \_\_\_\_\_ kg

**6. Living arrangements**

- Living with spouse/partner only
- Living with spouse/partner and family/friends
- Living as single with family/friends
- Living alone
- Other (Please specify) \_\_\_\_\_

**7. Highest education level reached**

- Primary school
- Secondary school
- Tertiary - Certificate/Diploma
- Tertiary - Degree
- Tertiary - Post-graduate
- Other (Please specify) \_\_\_\_\_

**8. Current employment**

- Employed/self-employed
- Unemployed
- Retired
- Home duties
- Other (Please specify) \_\_\_\_\_

**9. Preferred language spoken at home**

- English
- Italian
- Greek
- Turkish
- Other (Please specify) \_\_\_\_\_

**10. Reason for attendance at this cardiac rehabilitation program**

- Heart attack
- Angina
- Coronary artery bypass graft
- Angioplasty
- Raised blood cholesterol/blood fats
- Other (Please specify) \_\_\_\_\_

**11. Who referred you to this program ?**

- Hospital before discharge
- Doctor after discharge
- Other health professional after discharge
- Self
- Other cardiac rehabilitation program
- Other (Please specify) \_\_\_\_\_

**12. How many sessions of this program have you attended so far? \_\_\_\_\_**

**13. Does someone normally attend this program with you?  Yes  No**

If 'Yes', please specify:

- Spouse/partner
- Relative
- Friend

**14. Have you attended any other cardiac rehabilitation programs?  Yes  No**

If 'Yes':

When did you attend the previous program(s)? (month & year) \_\_\_\_\_

How many nutrition sessions did you attend in the previous program(s)? \_\_\_\_\_

**15. Have you ever received nutritional advice about your heart condition from a health professional (eg doctor, dietitian, naturopath)?  Yes  No**

If 'Yes', please specify the profession \_\_\_\_\_

**16. Have you gained nutritional information about your heart condition from any of the following sources? (You may tick more than one box)**

- |                          |                              |                          |                    |
|--------------------------|------------------------------|--------------------------|--------------------|
| <input type="checkbox"/> | Popular magazine             | <input type="checkbox"/> | Scientific journal |
| <input type="checkbox"/> | Newspaper                    | <input type="checkbox"/> | Radio/television   |
| <input type="checkbox"/> | Book                         | <input type="checkbox"/> | Family member      |
| <input type="checkbox"/> | Heart Foundation literature  | <input type="checkbox"/> | Friend             |
| <input type="checkbox"/> | Other (Please specify) _____ |                          |                    |

## Nutrition Knowledge Questionnaire

Some of the following statements are correct and some are incorrect.  
If you think the statement is correct, please place a tick (✓) in the box.  
If you think the statement is incorrect, please place a cross (✗) in the box.  
If you are unsure, please leave the box blank

1. Cottage cheese contains more fat than cheddar cheese.
2. Fat-trimmed, lean cuts of meat may contain less than 5% fat.
3. The fats found in fish are beneficial in heart disease.
4. Skinny milk contains less than 1% fat.
5. Saturated fats are more likely to be liquid rather than solid.
6. Cholesterol is found in all foods that contain fat or oil.
7. Olive oil contains monounsaturated fats.
8. Polyunsaturated fats are usually found in vegetable oils like sunflower and safflower oil.
9. A meat pie contains more fat than a loaf of bread.
10. Rev milk contains the same amount of fat as skinny milk.
11. Avocados contain cholesterol.
12. Butter and margarine contain the same amount of fat.
13. Roast potatoes are higher in fat than potato chips.
14. If an oil has been hydrogenated, it has become less saturated.
15. Farmhouse milk has less fat than regular milk.
16. Sausages, frankfurts and salami are high-fat meat products.
17. Toasted muesli is a low-fat breakfast cereal.
18. Nuts contain less fat than kidney beans and lentils.
19. Saturated and polyunsaturated fats have a similar kilojoule (calorie) value.
20. If a food product contains only vegetable oils, it must be low in saturated fat.
21. Seafoods contain polyunsaturated fat.



## Food Attitude Questionnaire

Please read each statement and tick (✓) the box below that is most applicable to you.  
Please tick ONE box only for each question.

1. People who have been eating the same food all their life should not have to change now.

<input type="checkbox"/>	Strongly disagree
<input type="checkbox"/>	Disagree
<input type="checkbox"/>	Undecided
<input type="checkbox"/>	Agree
<input type="checkbox"/>	Strongly agree

2. There will be plenty of time later on to reduce fat and increase fibre in the diet.

<input type="checkbox"/>	Strongly disagree
<input type="checkbox"/>	Disagree
<input type="checkbox"/>	Undecided
<input type="checkbox"/>	Agree
<input type="checkbox"/>	Strongly agree

3. Starting a low fat, high fibre diet now will give benefits to health in the long term.

<input type="checkbox"/>	Strongly disagree
<input type="checkbox"/>	Disagree
<input type="checkbox"/>	Undecided
<input type="checkbox"/>	Agree
<input type="checkbox"/>	Strongly agree

4. Health food is more trouble for the cook and takes longer to prepare.

<input type="checkbox"/>	Strongly disagree
<input type="checkbox"/>	Disagree
<input type="checkbox"/>	Undecided
<input type="checkbox"/>	Agree
<input type="checkbox"/>	Strongly agree

5. Low fat, high fibre food is tasteless and bland.

<input type="checkbox"/>	Strongly disagree
<input type="checkbox"/>	Disagree
<input type="checkbox"/>	Undecided
<input type="checkbox"/>	Agree
<input type="checkbox"/>	Strongly agree

6. **Changing to a low fat, high fibre diet is too complicated and difficult to do.**

<input type="checkbox"/>	Strongly disagree
<input type="checkbox"/>	Disagree
<input type="checkbox"/>	Undecided
<input type="checkbox"/>	Agree
<input type="checkbox"/>	Strongly agree

7. **Salads in season make an interesting and tasty meal.**

<input type="checkbox"/>	Strongly disagree
<input type="checkbox"/>	Disagree
<input type="checkbox"/>	Undecided
<input type="checkbox"/>	Agree
<input type="checkbox"/>	Strongly agree

8. **Once you are used to eating less fat you don't miss it at all.**

<input type="checkbox"/>	Strongly disagree
<input type="checkbox"/>	Disagree
<input type="checkbox"/>	Undecided
<input type="checkbox"/>	Agree
<input type="checkbox"/>	Strongly agree

9. **New diets are easier to start than to keep up.**

<input type="checkbox"/>	Strongly disagree
<input type="checkbox"/>	Disagree
<input type="checkbox"/>	Undecided
<input type="checkbox"/>	Agree
<input type="checkbox"/>	Strongly agree

10. **Low fat milk tastes better than full cream milk.**

<input type="checkbox"/>	Strongly disagree
<input type="checkbox"/>	Disagree
<input type="checkbox"/>	Undecided
<input type="checkbox"/>	Agree
<input type="checkbox"/>	Strongly agree

## Eating Habits Questionnaire

These questions ask about your **current** eating habits.  
Please place a tick (✓) in the box that is most applicable to you.  
Please tick **ONE** box only for each question.

1. How often do you eat fried food with a batter or breadcrumb coating?

- Never
- Less than once a week
- Once or twice a week
- Three to five times a week
- Six or more times a week

2. How often do you eat gravy, cream sauces or cheese sauces?

- Never
- Less than once a week
- Once or twice a week
- Three to five times a week
- Six or more times a week

3. How often do you add butter, margarine, oil or sour cream to vegetables, cooked rice or spaghetti?

- Never
- Less than once a week
- Once or twice a week
- Three to five times a week
- Six or more times a week

4. How often do you eat vegetables that are fried or roasted with fat or oil?

- Never
- Less than once a week
- Once or twice a week
- Three to five times a week
- Six or more times a week

5. How is your meat usually cooked?

- Only eat meat occasionally or never
- Grilled or roasted without added fat or oil
- Grilled or roasted with added fat or oil
- Stewed or goulash
- Fried

6. **How many times a week do you eat sausages, devon, salami, meat pies, hamburgers or bacon?**

- Never
- Less than once a week
- Once or twice a week
- Three to five times a week
- Six or more times a week

7. **How do you spread butter/margarine on your bread?**

- Don't use butter or margarine
- Thinly
- Thickly

8. **How many times a week do you eat chips or French fries?**

- Never
- Less than once a week
- Once or twice a week
- Three to five times a week
- Six or more times a week

9. **How often do you eat pastries, cakes, sweet biscuits or croissants?**

- Never
- Less than once a week
- Once or twice a week
- Three to five times a week
- Six or more times a week

10. **How many times a week do you eat chocolate, chocolate biscuits or sweet snack bars?**

- Never
- Less than once a week
- Once or twice a week
- Three to five times a week
- Six or more times a week

11. **How many times a week do you eat potato crisps, corn chips or nuts?**

- Never
- Less than once a week
- Once or twice a week
- Three to five times a week
- Six or more times a week

12. **How often do you eat cream?**

- Never
- Less than once a week
- Once or twice a week
- Three to five times a week
- Six or more times a week

13. **How often do you eat ice cream?**

- Never
- Less than once a week
- Once or twice a week
- Three to five times a week
- Six or more times a week

14. **How many times a week do you eat cheddar, edam or other hard cheese, cream cheese or cheese like camembert?**

- Never
- Less than once a week
- Once or twice a week
- Three to five times a week
- Six or more times a week

15. **What type of milk do you drink or use in cooking or in tea and coffee?**

- Skim or none
- Reduced fat
- Full cream and reduced fat
- Full cream
- Condensed

16. **How much of the skin on your chicken do you eat?**

(If you never eat chicken, please mark the 'none of the skin' response)

- None of the skin
- Some of the skin
- Most or all of the skin

17. **How much of the fat on your meat do you eat?**

(If you never eat meat, please mark the 'none of the fat' response)

- None of the fat
- Some of the fat
- Most or all of the fat

**Thank you for your cooperation. It is most appreciated.**

## **Appendix 7**

### **Part 3 Post-test Cardiac Rehabilitation**

#### **Program Nutrition Questionnaire**

**HEART FOUNDATION/DEAKIN UNIVERSITY  
CARDIAC REHABILITATION PROGRAM  
NUTRITION QUESTIONNAIRE 2**

Centre..... Questionnaire no..... Date.....

This second questionnaire is similar to questionnaire 1 and will be used to compare responses.

We would appreciate it if you would take the time to answer the attached questions as best as you can on your own.

**Although you have seen this form before, please answer as you feel now and do not try to remember how you answered before.**

As your responses need to be matched with your previous responses, we need identification to allow us to do this.

**Note: The information you provide will be strictly confidential and no identification will be used in the analysis or reporting of results.**

Name \_\_\_\_\_

The Heart Foundation in conjunction with Deakin University thank you for agreeing to take part in this study.

## Nutrition Knowledge Questionnaire 2

Some of the following statements are correct and some are incorrect.

If you think the statement is correct, please place a tick (✓) in the box.

If you think the statement is incorrect, please place a cross (✗) in the box.

If you are unsure, please leave the box blank.

Although you have seen this form before, please answer as you feel now and do not try to remember how you answered before.

1. Cottage cheese contains more fat than cheddar cheese.
2. Fat-trimmed, lean cuts of meat may contain less than 5% fat.
3. The fats found in fish are beneficial in heart disease.
4. Skinny milk contains less than 1% fat.
5. Saturated fats are more likely to be liquid rather than solid.
6. Cholesterol is found in all foods that contain fat or oil.
7. Olive oil contains monounsaturated fats.
8. Polyunsaturated fats are usually found in vegetable oils like sunflower and safflower oil.
9. A meat pie contains more fat than a loaf of bread.
10. Rev milk contains the same amount of fat as skinny milk.
11. Avocados contain cholesterol.
12. Butter and margarine contain the same amount of fat.
13. Roast potatoes are higher in fat than potato chips.
14. If an oil has been hydrogenated, it has become less saturated.
15. Farmhouse milk has less fat than regular milk.
16. Sausages, frankfurts and salami are high-fat meat products.
17. Toasted muesli is a low-fat breakfast cereal.
18. Nuts contain less fat than kidney beans and lentils.
19. Saturated and polyunsaturated fats have a similar kilojoule (calorie) value.
20. If a food product contains only vegetable oils, it must be low in saturated fat.
21. Seafoods contain polyunsaturated fat.



## Food Attitude Questionnaire 2

Please read each statement and tick (✓) the box below that is most applicable to you.  
Please tick **ONE** box only for each question.  
Although you have seen this form before, please answer as you feel now and do not try to remember how you answered before.

---

1. People who have been eating the same food all their life should not have to change now.

<input type="checkbox"/>	Strongly disagree
<input type="checkbox"/>	Disagree
<input type="checkbox"/>	Undecided
<input type="checkbox"/>	Agree
<input type="checkbox"/>	Strongly agree

2. There will be plenty of time later on to reduce fat and increase fibre in the diet.

<input type="checkbox"/>	Strongly disagree
<input type="checkbox"/>	Disagree
<input type="checkbox"/>	Undecided
<input type="checkbox"/>	Agree
<input type="checkbox"/>	Strongly agree

3. Starting a low fat, high fibre diet now will give benefits to health in the long term.

<input type="checkbox"/>	Strongly disagree
<input type="checkbox"/>	Disagree
<input type="checkbox"/>	Undecided
<input type="checkbox"/>	Agree
<input type="checkbox"/>	Strongly agree

4. Health food is more trouble for the cook and takes longer to prepare.

<input type="checkbox"/>	Strongly disagree
<input type="checkbox"/>	Disagree
<input type="checkbox"/>	Undecided
<input type="checkbox"/>	Agree
<input type="checkbox"/>	Strongly agree

5. Low fat, high fibre food is tasteless and bland.

<input type="checkbox"/>	Strongly disagree
<input type="checkbox"/>	Disagree
<input type="checkbox"/>	Undecided
<input type="checkbox"/>	Agree
<input type="checkbox"/>	Strongly agree

6. **Changing to a low fat, high fibre diet is too complicated and difficult to do.**

<input type="checkbox"/>	Strongly disagree
<input type="checkbox"/>	Disagree
<input type="checkbox"/>	Undecided
<input type="checkbox"/>	Agree
<input type="checkbox"/>	Strongly agree

7. **Salads in season make an interesting and tasty meal.**

<input type="checkbox"/>	Strongly disagree
<input type="checkbox"/>	Disagree
<input type="checkbox"/>	Undecided
<input type="checkbox"/>	Agree
<input type="checkbox"/>	Strongly agree

8. **Once you are used to eating less fat you don't miss it at all.**

<input type="checkbox"/>	Strongly disagree
<input type="checkbox"/>	Disagree
<input type="checkbox"/>	Undecided
<input type="checkbox"/>	Agree
<input type="checkbox"/>	Strongly agree

9. **New diets are easier to start than to keep up.**

<input type="checkbox"/>	Strongly disagree
<input type="checkbox"/>	Disagree
<input type="checkbox"/>	Undecided
<input type="checkbox"/>	Agree
<input type="checkbox"/>	Strongly agree

10. **Low fat milk tastes better than full cream milk.**

<input type="checkbox"/>	Strongly disagree
<input type="checkbox"/>	Disagree
<input type="checkbox"/>	Undecided
<input type="checkbox"/>	Agree
<input type="checkbox"/>	Strongly agree

## Eating Habits Questionnaire 2

These questions ask about your current eating habits. Please place a tick (✓) in the box that is most applicable to you. Please tick ONE box only for each question. Although you have seen this form before, please answer as you feel now and do not try to remember how you answered before.

1. How often do you eat fried food with a batter or breadcrumb coating?

- Never
- Less than once a week
- Once or twice a week
- Three to five times a week
- Six or more times a week

2. How often do you eat gravy, cream sauces or cheese sauces?

- Never
- Less than once a week
- Once or twice a week
- Three to five times a week
- Six or more times a week

3. How often do you add butter, margarine, oil or sour cream to vegetables, cooked rice or spaghetti?

- Never
- Less than once a week
- Once or twice a week
- Three to five times a week
- Six or more times a week

4. How often do you eat vegetables that are fried or roasted with fat or oil?

- Never
- Less than once a week
- Once or twice a week
- Three to five times a week
- Six or more times a week

5. How is your meat usually cooked?

- Only eat meat occasionally or never
- Grilled or roasted without added oil or fat
- Grilled or roasted with added oil or fat
- Stewed or goulash
- Fried

6. **How many times a week do you eat sausages, devon, salami, meat pies, hamburgers or bacon?**

- Never
- Less than once a week
- Once or twice a week
- Three to five times a week
- Six or more times a week

7. **How do you spread butter/margarine on your bread?**

- Don't use butter or margarine
- Thinly
- Thickly

8. **How many times a week do you eat chips or French fries?**

- Never
- Less than once a week
- Once or twice a week
- Three to five times a week
- Six or more times a week

9. **How often do you eat pastries, cakes, sweet biscuits or croissants?**

- Never
- Less than once a week
- Once or twice a week
- Three to five times a week
- Six or more times a week

10. **How many times a week do you eat chocolate, chocolate biscuits or sweet snack bars?**

- Never
- Less than once a week
- Once or twice a week
- Three to five times a week
- Six or more times a week

11. **How many times a week do you eat potato crisps, corn chips or nuts?**

- Never
- Less than once a week
- Once or twice a week
- Three to five times a week
- Six or more times a week

12. **How often do you eat cream?**

- Never
- Less than once a week
- Once or twice a week
- Three to five times a week
- Six or more times a week

13. **How often do you eat ice cream?**

- Never
- Less than once a week
- Once or twice a week
- Three to five times a week
- Six or more times a week

14. **How many times a week do you eat cheddar, edam or other hard cheese, cream cheese or cheese like camembert?**

- Never
- Less than once a week
- Once or twice a week
- Three to five times a week
- Six or more times a week

15. **What type of milk do you drink or use in cooking or in tea and coffee?**

- Skim or none
- Reduced fat
- Full cream and reduced fat
- Full cream
- Condensed

16. **How much of the skin on your chicken do you eat?**

(If you never eat chicken, please mark the 'none of the skin' response)

- None of the skin
- Some of the skin
- Most or all of the skin

17. **How much of the fat on your meat do you eat?**

(If you never eat meat, please mark the 'none of the fat' response)

- None of the fat
- Some of the fat
- Most or all of the fat

**Thank you for your cooperation. It is most appreciated.**

## Appendix 8

### Part 4 Cardiac Rehabilitation Program

#### Nutrition Satisfaction Questionnaire

**HEART FOUNDATION/DEAKIN UNIVERSITY  
CARDIAC REHABILITATION PROGRAM  
NUTRITION SATISFACTION QUESTIONNAIRE**

**These statements apply to the nutrition education session you have attended.  
Please read each statement and tick (✓) the box that is most applicable to you.  
Please tick ONE box only for questions 1-10 & 13.**

**1. The material presented was relevant to my needs.**

<input type="checkbox"/>	Strongly disagree
<input type="checkbox"/>	Disagree
<input type="checkbox"/>	Undecided
<input type="checkbox"/>	Agree
<input type="checkbox"/>	Strongly agree

**2. I understood the information presented in the session.**

<input type="checkbox"/>	Strongly disagree
<input type="checkbox"/>	Disagree
<input type="checkbox"/>	Undecided
<input type="checkbox"/>	Agree
<input type="checkbox"/>	Strongly agree

**3. The foods I need to eat and the foods I need to avoid were clearly explained.**

<input type="checkbox"/>	Strongly disagree
<input type="checkbox"/>	Disagree
<input type="checkbox"/>	Undecided
<input type="checkbox"/>	Agree
<input type="checkbox"/>	Strongly agree

**4. Questions from the group were answered satisfactorily.**

<input type="checkbox"/>	Strongly disagree
<input type="checkbox"/>	Disagree
<input type="checkbox"/>	Undecided
<input type="checkbox"/>	Agree
<input type="checkbox"/>	Strongly agree

**5. I was interested in everything covered in the session.**

<input type="checkbox"/>	Strongly disagree
<input type="checkbox"/>	Disagree
<input type="checkbox"/>	Undecided
<input type="checkbox"/>	Agree
<input type="checkbox"/>	Strongly agree

**6. There was too much information to take in.**

<input type="checkbox"/>	Strongly disagree
<input type="checkbox"/>	Disagree
<input type="checkbox"/>	Undecided
<input type="checkbox"/>	Agree
<input type="checkbox"/>	Strongly agree

7. **The way the material was presented made it difficult to follow.**

<input type="checkbox"/>	Strongly disagree
<input type="checkbox"/>	Disagree
<input type="checkbox"/>	Undecided
<input type="checkbox"/>	Agree
<input type="checkbox"/>	Strongly agree

8. **The session gave me good ideas about how to alter my diet.**

<input type="checkbox"/>	Strongly disagree
<input type="checkbox"/>	Disagree
<input type="checkbox"/>	Undecided
<input type="checkbox"/>	Agree
<input type="checkbox"/>	Strongly agree

9. **The session gave me more confidence to change my diet.**

<input type="checkbox"/>	Strongly disagree
<input type="checkbox"/>	Disagree
<input type="checkbox"/>	Undecided
<input type="checkbox"/>	Agree
<input type="checkbox"/>	Strongly agree

10. **I am confused about what foods to eat.**

<input type="checkbox"/>	Strongly disagree
<input type="checkbox"/>	Disagree
<input type="checkbox"/>	Undecided
<input type="checkbox"/>	Agree
<input type="checkbox"/>	Strongly agree

11. **I would have liked more information on (You may tick more than one box)**

<input type="checkbox"/>	Types of fats in foods
<input type="checkbox"/>	Food labels
<input type="checkbox"/>	Eating out
<input type="checkbox"/>	Recipes
<input type="checkbox"/>	Fibre
<input type="checkbox"/>	Alcohol

<input type="checkbox"/>	Low fat foods
<input type="checkbox"/>	Cholesterol
<input type="checkbox"/>	Take away food
<input type="checkbox"/>	Weight loss
<input type="checkbox"/>	Sugar
<input type="checkbox"/>	Salt

Other (Please comment) \_\_\_\_\_

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**12. I found the following were most helpful to me.**  
(You may tick more than one box)

<input type="checkbox"/>	Lecture material	<input type="checkbox"/>	Nutrition quiz
<input type="checkbox"/>	Group discussion	<input type="checkbox"/>	Overhead transparencies
<input type="checkbox"/>	Video	<input type="checkbox"/>	Food product displays
<input type="checkbox"/>	Slides	<input type="checkbox"/>	Written handouts
<input type="checkbox"/>	Posters/charts	<input type="checkbox"/>	Other (Please list) _____

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**13. Overall, I was satisfied with the session.** (Please tick one box only)

<input type="checkbox"/>	Strongly disagree
<input type="checkbox"/>	Disagree
<input type="checkbox"/>	Undecided
<input type="checkbox"/>	Agree
<input type="checkbox"/>	Strongly agree

**14. In what ways could the nutrition session have been improved?** \_\_\_\_\_

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Thank you for your cooperation. It is most appreciated.

**Appendix 9**  
**Part 5 Food Frequency Dietary**  
**Questionnaire**

# Dietary Questionnaire

Questions about what you usually eat and drink

Please fill in the date you completed this questionnaire:

DAY	MONTH	YEAR
	<input type="radio"/> JAN	<input type="radio"/> 1996
	<input type="radio"/> FEB	<input type="radio"/> 1997
<input type="radio"/> ①	<input type="radio"/> MAR	<input type="radio"/> 1998
<input type="radio"/> ②	<input type="radio"/> APR	<input type="radio"/> 1999
<input type="radio"/> ③	<input type="radio"/> MAY	<input type="radio"/> 2000
<input type="radio"/> ④	<input type="radio"/> JUN	<input type="radio"/> 2001
<input type="radio"/> ⑤	<input type="radio"/> JUL	<input type="radio"/> 2002
<input type="radio"/> ⑥	<input type="radio"/> AUG	<input type="radio"/> 2003
<input type="radio"/> ⑦	<input type="radio"/> SEP	<input type="radio"/> 2004
<input type="radio"/> ⑧	<input type="radio"/> OCT	<input type="radio"/> 2005
<input type="radio"/> ⑨	<input type="radio"/> NOV	<input type="radio"/> 2006
<input type="radio"/> ⑩	<input type="radio"/> DEC	<input type="radio"/> 2007

## INSTRUCTIONS:

This questionnaire is about your usual eating habits over the past 12 months. Where possible give only **one answer per question** for the type of food you eat **most often**. (If you can't decide which type you have most often, answer for the types you usually eat.)

- Use a soft pencil only, preferably 2B.
- Do not use **any** biro or felt tip pen.
- Erase mistakes fully.
- Make no stray marks.

Please MARK LIKE THIS:



NOT LIKE THIS:



1. How many pieces of fresh fruit do you usually eat per day? (Count 1/2 cup of diced fruit, berries or grapes as one piece.)

- I don't eat fruit
- less than 1 piece of fruit per day
- 1 piece of fruit per day
- 2 pieces of fruit per day
- 3 pieces of fruit per day
- 4 or more pieces of fruit per day

2. How many different vegetables do you usually eat per day? (Count all types, fresh, frozen or tinned.)

- less than 1 vegetable per day
- 1 vegetable per day
- 2 vegetables per day
- 3 vegetables per day
- 4 vegetables per day
- 5 vegetables per day
- 6 or more vegetables per day

3. What type of milk do you usually use?

- none
- full cream milk
- reduced fat milk
- skim milk
- soya milk

4. How much milk do you usually use per day? (Include flavoured milk and milk added to tea, coffee, cereal etc.)

- none
- less than 250 ml (1 large cup or mug)
- between 250 and 500 ml (1-2 cups)
- between 500 and 750 ml (2-3 cups)
- 750 ml (3 cups) or more

5. What type of bread do you usually eat?

- I don't eat bread
- high fibre white bread
- white bread
- wholemeal bread
- rye bread
- multi-grain bread

6. How many slices of bread do you usually eat per day? (Include all types, fresh or toasted and count one bread roll as 2 slices.)

- less than 1 slice per day
- 1 slice per day
- 2 slices per day
- 3 slices per day
- 4 slices per day
- 5-7 slices per day
- 8 or more slices per day

7. Which spread do you usually put on bread?

- I don't usually use any fat spread
- margarine of any kind
- polyunsaturated margarine
- monounsaturated margarine
- butter and margarine blends
- butter

8. On average, how many teaspoons of sugar do you usually use per day? (Include sugar taken with tea and coffee and on breakfast cereal etc.)

- none
- 1 to 4 teaspoons per day
- 5 to 8 teaspoons per day
- 9 to 12 teaspoons per day
- more than 12 teaspoons per day

9. On average, how many eggs do you usually eat per week?

- I don't eat eggs
- less than 1 egg per week
- 1 to 2 eggs per week
- 3 to 5 eggs per week
- 6 or more eggs per week

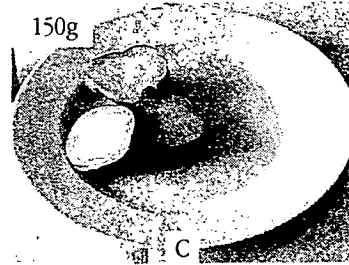
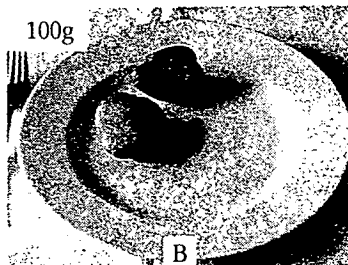
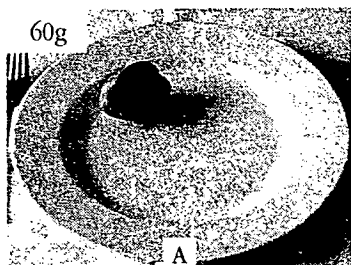
10. What types of cheese do you usually eat?

- I don't eat cheese
- hard cheeses, e.g. parmesan, romano
- firm cheeses, e.g. cheddar, edam
- soft cheeses, e.g. camembert, brie
- ricotta or cottage cheese
- cream cheese
- low fat cheese

For each food shown on this page, indicate **how much on average you would usually have eaten at main meals during the past 12 months**. When answering each question, think of the **amount** of that food you usually ate, even though you may rarely have eaten the food on its own.

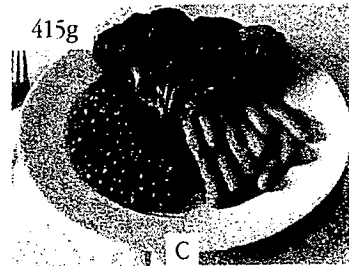
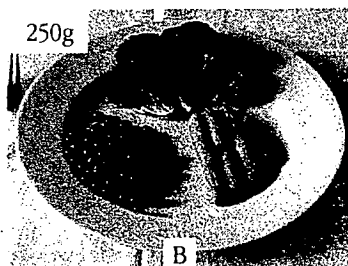
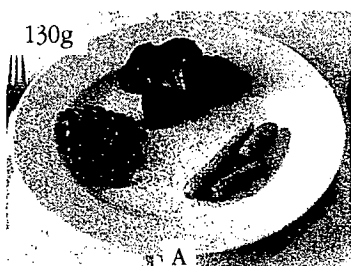
If you usually ate more than one helping, fill in the oval for the serving size closest to the **total amount** you ate.

11. When you ate potato, did you usually eat:  I never ate potato



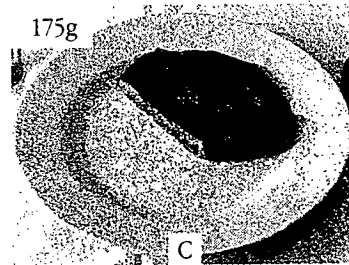
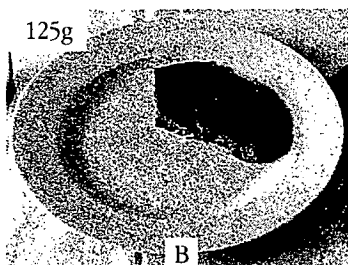
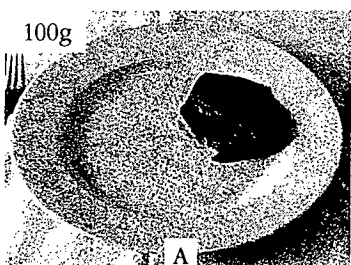
Less than A     A     Between A & B     B     Between B & C     C     More than C

12. When you ate vegetables, did you usually eat:  I never ate vegetables



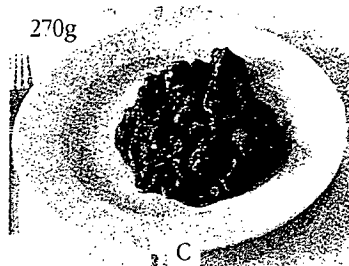
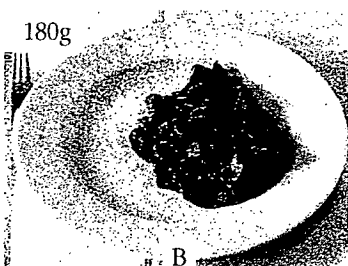
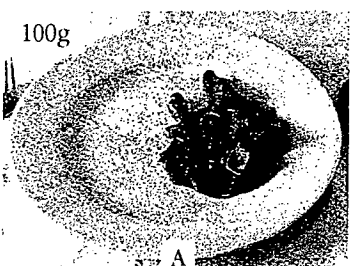
Less than A     A     Between A & B     B     Between B & C     C     More than C

13. When you ate steak, did you usually eat:  I never ate steak



Less than A     A     Between A & B     B     Between B & C     C     More than C

14. When you ate meat or vegetable casserole, did you usually eat:  I never ate casserole



Less than A     A     Between A & B     B     Between B & C     C     More than C

5. Over the last 12 months, on average, *how often* did you eat the following foods? Please completely fill one oval in every line. Please MARK LIKE THIS:     NOT LIKE THIS:

# Times You Have Eaten

NEVER	less than once	1 to 3 times	1 time	2 times	3 to 4 times	5 to 6 times	1 time	2 times	3 or more times
	per month		per week			per day			

## CEREAL FOODS, SWEETS & SNACKS

All Bran™	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sultana Bran™, FibrePlus™, Branflakes™	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Weet Bix™, Vita Brits™, Weeties™	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cornflakes, Nutri-grain™, Special K™	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Porridge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Muesli	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Rice	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pasta or noodles (include lasagne)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Crackers, crispbreads, dry biscuits	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sweet biscuits	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cakes, sweet pies, tarts and other sweet pastries	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Meat pies, pasties, quiche and other savoury pastries	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pizza	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hamburger with a bun	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Chocolate	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Flavoured milk drink (cocoa, Milo™ etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nuts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Peanut butter or peanut paste	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Corn chips, potato crisps, Twisties™ etc.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Jam, marmalade, honey or syrups	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vegemite™, Marmite™ or Promite™	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## DAIRY PRODUCTS, MEAT & FISH

Cheese	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ice-cream	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Yoghurt	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Beef	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Veal	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Chicken	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lamb	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pork	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bacon	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ham	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Corned beef, luncheon meats or salami	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sausages or frankfurters	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fish, steamed, grilled or baked	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fish, fried (include take-away)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fish, tinned (salmon, tuna, sardines etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## FRUIT

Tinned or frozen fruit (any kind)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fruit juice	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Oranges or other citrus fruit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Apples	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pears	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bananas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Watermelon, rockmelon (cantaloupe), honeydew etc.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pineapple	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strawberries	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Apricots	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Peaches or nectarines	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mango or paw paw	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Avocado	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

<i>Times You Have Eaten</i> CONTINUED	N E V E R	less than once	1 to 3 times	1 time	2 times	3 to 4 times	5 to 6 times	1 time	2 times	3 or more times
		per month			per week			per day		
		<b>VEGETABLES (INCLUDING FRESH, FROZEN AND TINNED)</b>								
Potatoes roasted or fried (include hot chips)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Potatoes cooked without fat	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tomato sauce, tomato paste or dried tomatoes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fresh or tinned tomatoes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Peppers (capsicum)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lettuce, endive, or other salad greens	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cucumber	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Celery	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Beetroot	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Carrots	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cabbage or Brussels sprouts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cauliflower	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Broccoli	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Silverbeet or spinach	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Peas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Green beans	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bean sprouts or alfalfa sprouts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Baked beans	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Soy beans, soy bean curd or tofu	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other beans (include chick peas, lentils etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pumpkin	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Onion or leeks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Garlic (not garlic tablets)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mushrooms	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Zucchini	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

16. Over the last 12 months, how often did you drink beer, wine and/or spirits?

<i>Times That You Drank</i>	N E V E R	less than once a month	1-3 days per month	1 day per week	2 days per week	3 days per week	4 days per week	5 days per week	6 days per week	every day
Beer (low alcohol)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Beer (full strength)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Red wine	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
White wine (include sparkling wines)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fortified wines, port, sherry, etc.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Spirits, liqueurs, etc.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

When answering the next two questions, please convert the amounts you drink into glasses using the examples given below.

For spirits, liqueurs, and mixed drinks containing spirits, please count each nip (30 ml) as one glass.

1 can or stubby of beer = 2 glasses

1 bottle wine (750 ml) = 6 glasses

1 large bottle beer (750 ml) = 4 glasses

1 bottle of port or sherry (750 ml) = 12 glasses

17. Over the last 12 months, on days when you were drinking, how many glasses of beer, wine and/or spirits altogether did you usually drink?

TOTAL NUMBER OF GLASSES PER DAY	1	2	3	4	5	6	7	8	9	10 or more
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

18. Over the last 12 months, what was the maximum number of glasses of beer, wine and/or spirits that you drank in 24 hours?

MAXIMUM NUMBER OF GLASSES PER 24 HOURS	1-2	3-4	5-6	7-8	9-10	11-12	13-14	15-16	17-18	19 or more
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Appendix 10**  
**Part 5 Follow-up Questionnaire**

## Questionnaire Three

Height:

Weight:

**1. Which of the following statements best describes your CURRENT habits regarding a low-fat diet. Please circle ONE only.**

- a. I have not made any changes to the amount of fat in my diet and I have no intention of starting.
- b. I have not made any changes to the amount of fat in my diet, I am thinking about starting, but not in the next two weeks.
- c. I have not made any changes to the amount of fat in my diet but I intend to start in the next two weeks.
- d. I have a low-fat diet at the moment, but I have been doing so for less than six months.
- e. I have been having a low-fat diet for more than six months.

**2. Since rehabilitation 12-18 months ago, have you**

Experienced additional heart complications	Yes/No
Attended further cardiac rehabilitation	Yes/No
Required further medical help	Yes/No
Had further dietary advice	Yes/No
Continued the suggested exercise	Yes/No

**3. Did you find the Cardiac Rehabilitation Program CRP**

Very helpful      helpful      somewhat helpful      no help

**4. What else/more would you have liked in the program?**

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**Thankyou for your co-operation. It is most appreciated.**



## Appendix 11

### Part 3 Results

#### Change in Questionnaire Items after Nutrition Education in the 1-hour and 4½- hour Nutrition Education Groups

### **Part 3 Results**

#### **Change in Questionnaire Items after NE in the 1-hour and 4½-hour NE Groups**

Questionnaire items were analysed individually for the number of positive responses pre-NE and the number of participants giving improved responses at post-test, in terms of a higher or lower score post-NE for each individual item.

For knowledge, in both groups, item 16, about the fat in sausages, frankfurts and salami, had the highest number of positive responses pre-NE and item 14, about hydrogenated oils, had the lowest (see Table 1). In the 1-hour NE group, the item with the greatest improvement was statement 7 about the type of fat in olive oil. Statements 2, 9, 10, 12 and 16, about the amount of fat in meat, margarine, butter and dairy, also had significant improvements in this group.

In the 4½-hour group, the knowledge statements showing no significant improvement were statements 4, 11, 12, 13, 16 and 20 about the fat in milk, avocados, butter and margarine, roast potatoes, sausage-type meats and vegetable oil, respectively.

Statements 4, 13 and 16 had a relatively high level of correct responses at pre-test and therefore little room for improvement but statements 11, 12 and 20 did not. Statements 7, about the type of fat in olive oil, and 21, about the type of fat in seafood, showed greater improvement, followed by statement 18, about the fat in nuts and statement 5, about the nature of saturated fats, all of which had a relatively low number of positive pre-test scores.

For attitude, in both groups, item 9, about new diets being easier to start than keep up, and 10, about preferring the taste of low-fat milk, had a lower number of pre-NE positive responses and item 3, about the health benefits of low-fat, high-fibre diets had the highest. There was no significant improvement for any attitude item in the 1-hour group but the 4½-hour group had significant improvements for all items except item 8, about getting used to eating less fat and not missing it, and item 10. Pre-NE, there were a relatively high number of

positive responses for item 8 but only a low number for item 10. The item with the greatest improvement was item 2, about there being plenty of time later on to reduce fat and increase fibre in the diet, in spite of having a relatively high level of positive responses at pre-test. The item with the least improvement was item 7, about salads being interesting and tasty meals, which had a high number of positive responses at pre-test.

**Table 1**  
Proportion of Cardiac Rehabilitation Participants with Positive Responses to Knowledge and Attitude Questionnaire Items before Nutrition Education and Proportion with Improved Responses after Nutrition Education

Questionnaire Item		Pre-NE positive responses (%)		Post-NE improved responses (%)	
		1-hour NE	4½-hour NE	1-hour NE	4½-hour NE
<b>Knowledge</b>	Statement 1	75	61	-	16**
	2	69	58	14*	20**
	3	81	79	-	11*
	4	71	70	-	-
	5	50	36	-	28***
	6	21	23	-	16**
	7	46	40	19*	33***
	8	76	64	-	21***
	9	80	75	13*	14*
	10	44	40	14*	25***
	11	33	36	-	-
	12	28	31	13*	-
	13	76	69	-	-
	14	15	15	-	18**
	15	78	60	-	23***
	16	89	89	9*	-
	17	35	20	-	18**
	18	69	55	-	29***
	19	29	23	-	18*
	20	26	24	-	-
	21	40	33	-	33***
<b>Attitude</b>	Statement 1	79	79	-	45*
	2	90	78	-	48***
	3	96	89	-	39**
	4	74	65	-	38*
	5	63	61	-	38*
	6	80	78	-	34**
	7	91	89	-	29**
	8	80	74	-	-
	9	25	38	-	36*
	10	30	36	-	-

\*p<.05 (2-tailed) \*\*p<.01 (2-tailed) \*\*\*p<.001 (2-tailed) NE, nutrition education

For fat intake, neither group improved for questions 4, 9, 11 and 13, which related to frying or roasting vegetables; eating pastries, cakes, sweet biscuits or croissants; eating potato crisps, corn chips or nuts; and eating ice cream, respectively (see Table 2). The number of pre-NE low-fat responses was relatively high for items 4, 11 and 13, but relatively low for item 9.

In the 1-hour group, the most improvement was for question 17 about eating the fat of meat, which had a very high number of low-fat responses at pre-test, and the least improvement was for item 10, about eating chocolate, chocolate biscuits and sweet snack bars, which had a relatively low number of low-fat responses at pre-test. In the 4½-hour group, the most improvement was for question 14, about eating cheese. The least improvement was for question 7, relating to the amount of butter or margarine used on bread, which had a high number of low-fat responses at pre-test.

**Table 2**  
Proportion of Cardiac Rehabilitation Participants with Positive Responses to Fat Intake Questionnaire Items before Nutrition Education and Proportion with Improved Responses after Nutrition Education

Questionnaire Item	Pre-NE positive responses (%)		Post-NE improved responses (%)	
	1-hour NE	4½-hour NE	1-hour NE	4½-hour NE
<b>Intake</b> Question 1	81	71	-	38***
2	71	63	-	41***
3	69	64	-	38***
4	85	70	-	-
5	70	63	-	35***
6	86	73	-	39***
7	95	88	-	21**
8	88	83	-	30**
9	53	59	-	-
10	70	77	1*	34***
11	90	84	-	-
12	89	95	-	30**
13	66	70	-	-
14	48	56	4*	43***
15	83	84	9*	23*
16	95	90	10*	24**
17	99	94	11*	-

\*p<.05 (2-tailed) \*\*p<.01 (2-tailed) \*\*\*p<.001 (2-tailed) NE, nutrition education