THE CORRELATES OF CORONARY ANGIOPLASTY PATIENTS' PERCEPTIONS OF THEIR RISK FOR CARDIOVASCULAR DISEASE PROGRESSION AND DEATH

by

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ABSTRACT

In the context of cardiovascular disease, health initiatives and efforts are aimed at increasing awareness of those "at risk" about the causes of heart disease and the lifestyle behaviours necessary to reduce risks. Despite being informed of their "at risk" status, many individuals do not implement the necessary changes to their lifestyle to mitigate their cardiovascular risk. This may be explained, in part, by a mismatch between an individual's perception of their risk and their actual risk. Individuals who have optimistic or pessimistic biases about their true cardiovascular risk may be less likely to adopt heart healthful lifestyle behaviours.

Using a cross-sectional, correlational design, 134 patients undergoing coronary angioplasty were asked about their perceptions of risk of cardiovascular disease progression and death. To determine the accuracy of these perceptions, the respondents' subjective perceptions were compared to objective estimates of their risk relative to the severity of their cardiac disease. To understand correlates of these perceptions, respondents were asked detailed questions about their cardiac history, cardiovascular risk factors, current lifestyle behaviours, and sociodemographic characteristics. Once the level of accuracy for the risk perceptions was established (accurate, or optimistically or pessimistically biased), data were analysed to determine the relationship between level of accuracy and the adoption of healthful lifestyle behaviours.

The results of this study revealed that the respondents' perceptions varied in the level of accuracy: 44.3% were accurate, 32.7% were optimistic, and 23.0% were pessimistic. Age and duration of diagnosis emerged independently as the most significant factors contributing to level of accuracy. The respondents with accurate perceptions of their risk had the shortest duration of diagnosis; those with the longest duration of diagnosis were most likely to be pessimistic.

Younger respondents were more accurate in their risk perceptions; older respondents were most likely to be optimistic. Level of accuracy was not related to the individual adopting healthful lifestyle behaviours. Respondents holding accurate perceptions of their risk were neither more nor less likely than respondents holding optimistically or pessimistically biased perceptions to adhere to healthful lifestyle behaviours associated with reduced risk for cardiovascular disease.

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CHAPTER 1: INTRODUCTION

Knowledge about risk factors and perceptions of risk or susceptibility are believed to be precursors to the adoption of behaviour changes to reduce disease morbidity and mortality. A multitude of public health initiatives and health awareness campaigns are focused on identifying those at risk for specific diseases and delivering disease-specific prevention messages. Health-care professionals often make the assumption that once identified as being "at-risk", individuals will do what they can to reduce their risk. It is apparent, however, that some individuals, despite being informed of their "high risk" status, do not implement necessary changes to incorporate healthful behaviours to reduce their risk. One explanation for this incongruity is that there is often a mismatch between an individual's perception of their risk and their actual risk for developing disease. Consequently, individuals at risk may be less likely to implement necessary healthful behaviours because they hold inaccurate perceptions of their disease risk. These inaccurate perceptions may be optimistically or pessimistically biased. Individuals who are at high risk that perceive themselves to be at low risk are said to have optimistic biases; conversely, individuals at low risk that consider themselves to be at high risk are said to have pessimistic biases (Weinstein, 1980). Optimistically biased individuals may be less likely to change because they do not perceive themselves to be at increased risk; pessimistically biased individuals may be unlikely to change because of excessive fatalism (Strecher, Kreuter, & Korbin, 1995).

In the context of cardiovascular disease, a consistent public health message is aimed at increasing awareness about the causes of heart disease and behaviours to reduce risks in order to prompt individuals to change harmful lifestyle behaviours. The public health message about cardiovascular risk factors, however, does not seem to be getting through to all Canadians. Of adult Canadians, 31% cannot describe one of the major risk factors for heart disease, and nearly one half of all adult Canadians are unaware of the effects of smoking in relation to heart disease (Health Canada, 1995).

Understanding how individuals perceive their risk for cardiovascular disease should be an integral part of any cardiovascular risk reduction strategy, however, very few studies have specifically looked at the risk perceptions or perceived susceptibility of patients with known cardiac disease. More importantly, knowledge of the correlates of perceived risk, whether accurate, optimistic or pessimistic, may be useful in identifying and responding to the barriers to adoption of healthful behaviours and risk reduction.

Purpose of the Study

This research was designed to examine the perceptions of risk of cardiovascular disease progression and death in individuals with established coronary artery disease (CAD) undergoing Percutaneous Transluminal Coronary Angioplasty (PTCA). The purpose of this study was to answer the following three questions:

1. What is the correspondence between an individual's perceptions and objective evaluations of risk of cardiac disease progression and death?
2. What factors are associated with accurate, pessimistic or optimistic risk perceptions?
3. What is the relationship between perceptions of risk of cardiac disease progression and death and the adoption of healthful lifestyle behaviours known to be associated with reducing risk of cardiac disease?

Definition of Terms

The following definitions are provided for key concepts employed in this study.

Risk: A fusion of probability and something adverse, unfavourable or dangerous (Palmer & Sainfort, 1993).

Risk factor: A characteristic associated with increased probability of disease (Croyle & Jemmott, 1991).

Lifestyle: A complex of related practices and behavioural patterns that are maintained with some consistency over time. Includes conscious health-directed behaviour as well as unconscious health-related behaviour and practices that are pursued for non-health purposes but with health consequences or risks (Green & Kreuter, 1991).

Healthful lifestyle behaviour: An activity undertaken by an individual for the purpose of preventing illness or for the purpose of attaining an even greater level of health. Preventive healthful lifestyle behaviours associated with reduction of mortality from cardiovascular disease include:

a) Maintenance or attainment of desirable body weight

b) Abstinence from tobacco

c) Moderate or low consumption of alcohol

d) Regular exercise

e) Moderate or low consumption of foods high in saturated fat or cholesterol

f) Avoidance of excessive or constant stress

g) Participation in hypertension, dyslipidemia, and diabetes screening initiatives

h) Adherence to prescribed medication regimens

When the individual fails to engage in these healthful lifestyle behaviours, the contrary *unhealthful* lifestyle behaviour constitutes a behavioural or behavioural-mediated risk factor.

Risk perception: Risk perceptions are interpretations or impressions of the possibility or chance of threats or specific, adverse consequences or outcomes. Risk perceptions are subjective and are influenced by an individual's knowledge, beliefs and experiences.

Objective risk: An estimated likelihood of a specific outcome based on objectively and empirically derived criteria.

CHAPTER 2: LITERATURE REVIEW

A comprehensive search for published literature related to risk perception and heart disease was conducted by electronically perusing the following databases: Comprehensive Index of Nursing and Allied Health Literature (CINAHL), Health & Social Science Index (HSSI), Medline (encompasses information from Index Medicus, International Nursing and others), Psychological Abstracts, and Social Science Citation Index (SSCI). Searches were limited to English-language materials published in the last 11 years (1989 to 2000). Some key literature published prior to 1989 is included because of its relevance to the topic. Search strategies also included a manual search for relevant literature cited in the retrieved publications. For the purpose of the literature search, the following key words and key word combinations were used: risk perception, risk assessment, risk behaviour, risk factor, risk taking behaviour, cardiovascular disease risk, cardiovascular risk factors, risk assessment and risk communication.

Cardiovascular Disease

Cardiovascular diseases remain the leading cause of death worldwide despite major breakthroughs and discoveries related to prevention, early diagnosis and treatment (Braunwald, 1997). In addition, individuals living with cardiovascular disease often experience significant morbidity and disability. In Canada, it is estimated that cardiovascular disease accounts for 37% of all deaths, with ischaemic heart disease accounting for the greatest percentage of deaths at 21% (Health Canada, 1997). Twenty-three thousand Canadians die each year as the result of an acute myocardial infarction (MI) with over one half of these deaths occurring before the victim reaches a hospital (Health Canada).

Whereas a reduction in mortality from cardiovascular disease has occurred since the 1960's (based on age-adjusted rates of cardiovascular death), experts believe there will be a steep rise in the prevalence of cardiovascular disease as the "baby–boom" generation reaches the age of 50 years and older. Even if the age-adjusted rate of cardiovascular disease mortality continues to decline, the absolute mortality from cardiovascular disease will likely increase as the average age of the population rises and the number of people over the age of 60 years increases (Braunwald, 1997; Hennekens, 1998).

An immense fiscal burden accompanies cardiovascular disease. In Canada, it is estimated that cardiovascular diseases cost the economy approximately $19 billion every year in medical and hospitalisation expenses, loss of income, and lost productivity (Health Canada, 1997). Costs are expected to continue to escalate as new technologies, interventions and medications to diagnose and treat cardiovascular disease become more sophisticated, and hence, more expensive.

One of the most efficient and cost effective means of treating cardiovascular disease is through the implementation of cardiovascular risk reduction strategies for primary, secondary, and in some cases, tertiary prevention (Pearson & Fuster, 1996). Health promotion and cardiac rehabilitation programs involving exercise, smoking cessation, and optimal control of lipids, hypertension and diabetes can reduce cardiovascular mortality and morbidity (O'Connor et al., 1989; Oldridge, Guyatt, Fischer, & Rimm, 1988) by improving functional capacity (Vanhees, Fagard, Thijs, & Amery, 1995), attenuating myocardial ischaemia (Ehsani, Heath, Hagberg, Sobel, & Holloszy, 1981), retarding the progression and fostering the reversal of coronary atherosclerosis (Brown et al., 1990) and reducing the risk of further cardiac events (Fletcher et al., 1992).

Although there are new cardiovascular diagnostic modalities, innovative revascularisation techniques and sophisticated drug regimens available, risk factor reduction remains the cornerstone of treatment for individuals who have, or are at risk for, cardiovascular disease. In order for cardiovascular risk reduction strategies to be effective, however, target individuals must first perceive that they are at risk (Silagy, Muir, Coulter, Thorogood, & Roe, 1993). Understanding how individuals perceive their risk for cardiovascular disease and knowing the factors that may contribute to inaccurate perceptions of risk provide useful information for health-care providers working with individuals at risk for cardiovascular disease.

Cardiovascular Risk Factors

A brief overview of cardiovascular disease risk factors is provided to highlight current knowledge in this area. Various factors have been associated with increased risk for cardiovascular disease, ranging from lifestyle behaviours to biochemical measures. It is important to recognise that association does not indicate causation and that not every individual with an identified risk factor is destined to develop cardiovascular disease. In fact, despite knowing much about the risk factors associated with cardiovascular disease, approximately one half of all patients with cardiovascular disease do not have any of these established risk factors (Braunwald, 1997; Furberg et al., 1996).

One caveat to consider in the context of cardiovascular risk information is the complexity involved when health-care professionals attempt to translate empirical knowledge of cardiovascular risk factors into effective, efficient health messages for individuals "at risk". This complexity may result in part from they way the risk message is constructed by the health-care professional. For example, health-care professionals frequently include numbers or statistical probabilities with risk information not only as a persuasive strategy, but also for justification to provide information that may be unwanted by the recipient of the information (Adelsward & Sachs, 1996). Although numeracy may be helpful and offer some advantage in objectifying information (e.g., telling a patient their hip-to-waist ratio rather than telling them they are obese), there is also potential for errors of interpretation because of problems associated with mathematical illiteracy (Finer & Sachs, 1995; Redelmeier, Rozin, & Kahneman, 1993). Further, giving risk information in terms of relative risk, absolute risk or disease free survival may influence compliance to prescribed regimens. Examining how the format of efficacy information within risk messages may influence patients' likelihood of taking cholesterol medication, Hux and Naylor (1995) found that 88% of patients presented with information in terms of relative risk were willing to take medication compared to when the information was explained in terms of absolute risk (42%) or disease free survival (40%).

Similarly, using subjective terminology to qualify the degree of risk such as "rare", "unlikely" or "very likely" may contribute to errors of interpretation. The scope for interpretation of messages using subjective terminology becomes quite broad, as these types of qualifying words are not consistently defined and are influenced by personal judgements, experiences and situations. In turn, health-care professionals should cautiously evaluate the perceptions articulated by patients when subjective terminology is used, for similar reasons (Adelsward & Sachs, 1996).

In light of this literature, how cardiovascular risk information is both relayed to and received by the individual "at risk" may influence the individual's understanding of their risk factors for cardiovascular disease. However, a gap in the literature exists when one searches for optimal strategies and methods to use when constructing and communicating risk messages. This type of information would be an asset to health-care professionals as they construct and deliver cardiovascular risk-factor messages to those "at risk", to help those individuals accurately perceive their risks and implement changes in behaviour to reduce cardiovascular risk.

Nonmodifiable and Modifiable Risk Factors

Cardiovascular risk factors are usually categorised as nonmodifiable or modifiable. Nonmodifiable risk factors include age (>45 years for men, >55 years for women, or postmenopausal status without hormone replacement therapy [HRT]), gender (male or postmenopausal [including surgically-induced menopause] female), family history of cardiovascular disease (in a first degree relative male < 55 years or female <65 years), and personal history of cardiovascular disease. Nonmodifiable cardiovascular risk factors are unalterable; their effects are immutable by any intervention (although there is significant effort underway by researchers to determine if HRT will decrease cardiovascular risk in post-menopausal women), including changes in behaviour and lifestyle.

Modifiable cardiovascular risk factors are amenable to changes that are expected to result in attenuation of cardiovascular risk status and include smoking, dyslipidemia, diabetes, hypertension, obesity, and sedentary lifestyles. Reduction of risk may be accomplished directly or indirectly through the introduction of lifestyle changes (such as smoking cessation, adoption and maintenance of regular exercise, adherence to low fat diet) and may also include adjunctive pharmacotherapy (such as lipid lowering medications or hypoglycaemic or anti-hypertensive agents).

Metabolic Cardiovascular Risk Factors

Currently, it is hypothesised that genetic, thrombogenic, or inflammatory factors may mediate the process of atherosclerosis. Some of these emerging metabolic risk factors include homocysteine, plasma fibrinogen, factor VII, PAI -I, lipoprotein (a), C-reactive protein, and Chlamydia (Braunwald, 1997; Hennekens, 1998). In addition to these metabolic risk factors, there is growing interest in the function of the microvasculature, namely the role of endothelial dysfunction in the generation of atherosclerotic plaques and acute coronary syndromes (Pepine, 1998). There is existing evidence demonstrating the effects of lifestyle behaviours such as smoking and high fat diets, as well as hyperlipidemia and diabetes as contributors to endothelial dysfunction (Celermajer et al., 1996; Celermajer, Sorensen, Bull, Robinson, & Deanfield, 1994).

Psychological Cardiovascular Risk Factors

There has been considerable discussion regarding the effects of psychosocial factors in the context of cardiovascular disease. Chronic and acute states of psychological stress are identified by some experts as risks for both the development of, and progression of, cardiovascular disease. Contributors to acute and chronic states of psychological stress that may influence cardiovascular disease status include lower socio-economic status, isolation, poor self esteem, job strain, Type "A" behaviour, hostility, and depression (Health Canada, 1993; Kop, 1997; Williams & Littman, 1996).

In the context of cardiovascular disease, current evidence indicates that the degree of risk associated with depression is equivalent to and independent of traditional risk factors (Frasure-Smith & Lesperance, 1998). Depression also is an important predictor of mortality after myocardial infarction (Frasure-Smith, Lesperance, & Talajic, 1995). Further, the presence of depressive symptoms appears to affect the ability of an individual to adopt and maintain healthful lifestyle behaviour such as smoking abstinence, regular exercise, and appropriate diets (Carney, Freedland, Eisen, Rich, & Jaffe, 1995).

Despite the evidence of an association between psychological stress and cardiovascular disease, there remains significant debate regarding a common definition and conceptualisation of psychological stress as a risk factor. Further, the interactions between psychological factors and the as yet unidentified pathophysiological mechanisms by which they increase risk in the context of cardiovascular disease are not well established (Health Canada, 1993).

Interrelation of Cardiovascular Risk Factors

Clearly, cardiovascular disease has a multifactorial aetiology and experts stress the importance of evaluating the overall burden of risk rather than considering risk factors in isolation. When more than one risk factor (modifiable or nonmodifiable) is present, the magnitude of risk for developing atherosclerosis increases because of a multiplicative, rather than an additive, effect (Califf, Armstrong, Carver, D'Agostino, & Strauss, 1996; Health Canada, 1995; Pyorala, de Backer, Graham, Poole-Wilson, & Wood, 1994). Helping an individual to eliminate even one risk factor for cardiovascular disease can result in significant benefit in terms of overall risk (Silagy et al., 1993). Some individuals, however, prefer an "all or nothing" approach to risk factor reduction and undervalue the benefits of partial risk reduction, which in most situations is more realistic than the illusion of being completely "risk-free" (Redelmeier et al., 1993).

Individuals with clinically established cardiovascular disease, at any level or combination of risk factors, have a much higher risk for cardiovascular disease progression and subsequent coronary events than asymptomatic individuals and therefore have the most to gain from risk factor modification intervention. Action toward risk factor reduction should be included as a component of the clinical care offered to individuals with clinically evident cardiovascular or other atherosclerotic or vascular disease (Pyorala et al., 1994).

Cardiovascular Risk Factor Prevalence in Canada

According to the Provincial Heart Health Surveys conducted by Health Canada, 63% of Canadian adults have at least one of the three major modifiable risk factors of smoking, high blood pressure, and high serum cholesterol (Health Canada, 1995). This rate is the highest in Nova Scotia and Newfoundland with a rate of 69%, and lowest in the western provinces of British Columbia and Alberta at 59% and 58%, respectively. Obesity reigns as the most prevalent risk factor with 48% of Canadians having a body mass index (BMI) equal or greater than 25 kg/m^2. Forty-three percent of all Canadians have an elevated level of serum cholesterol, and over one third (37%) of adult Canadians are described as sedentary. From these surveys, it is estimated that 27% of adult Canadians are smokers, 15% have high blood pressure, and approximately 4% are self-reported diabetics.

It is important to note that the prevalence data for hypertension and diabetes could actually be higher if defined by the criteria of more recent expert consensus definitions. For example, the definition of hypertension in the Provincial Heart Health Surveys was defined as "diastolic blood pressure greater than 90mm Hg, or being treated with medication, salt restricted diet, or weight loss program" (Health Canada, 1995, p. 7), whereas consensus committees in Canada and the United States suggest a systolic blood pressure of 140mm Hg or greater or diastolic blood pressure of 90 mm Hg or greater as the cut points for diagnosis of hypertension, with even more stringent targets if an individual is taking antihypertensive medication (Feldman et al., 1999; JNC VI, 1997). Recent changes instituted by the Canadian Diabetes Association have lowered the diagnostic criteria for the diagnosis of diabetes mellitus to a fasting plasma glucose of 7.0 mmol/L or greater (Meltzer et al., 1998). In addition, individuals with fasting plasma glucose levels between 6.1 and 7.0mmol/L are now considered to have impaired fasting glucose and are recognised to be at higher risk for developing diabetes mellitus and cardiovascular disease than the general population.

The Perception of Risk

In examining the risk perception literature, it appears that the majority of research in this area originates from the psychological arena although other disciplines such as nursing and medicine are contributing to this field of research. There is extensive literature available that examines the perceptions of risk for adverse events (including environmental hazards such as exposure to radiation, motor vehicle accidents, as well as diseases such as cancer, AIDS, or heart disease) in healthy populations. These "healthy populations" were often comprised of university students who were compensated for participation in studies (either financially or by course credits), or by way of population telephone surveys. In some studies, healthy individuals had to meet certain risk criteria to be included in a study (e.g., had to have a relative with breast cancer, but not a diagnosis of breast cancer, to be included in a study of risk perceptions for breast cancer). In comparison, very few studies were found that examined the risk perceptions of individuals who had a specific disease such as heart disease or cancer.

The risk perception literature that was reviewed may be summarised according to the following three themes: (a) distortions of accurate risk perceptions (namely optimistic and pessimistic biases); (b) risk perceptions of healthy individuals; and (c) risk perceptions of individuals with cardiac disease. Very little is known about how individuals with cardiovascular disease perceive their risks for disease progression and death. Because of this paucity of information, general information on optimistic and pessimistic biases and the risk perceptions of healthy individuals are explored in this review, but the generalisability of these works to the population of interest in the present study is uncertain.

Optimistic and Pessimistic Biases

Health-care professionals often assume that simply providing information to individuals about risk factors is adequate for the individual to assess, evaluate, and modify his or her personal risk profile. Knowledge about risk factors does not always result in accurate risk perceptions. Individuals most often have inaccurate perceptions of their risk: overestimating their risk (pessimistic bias) or underestimating their risk (optimistic bias) (Weinstein, 1980). It is suggested that those individuals who are optimistically biased are less likely to implement strategies to reduce their risks. Individuals with pessimistic biases often endure unnecessary anxiety and stress, and may not adopt healthful behaviours because of excessive fatalism (Strecher et al., 1995).

Risk perception biases are not stable character traits, but vary from one risk to another (Kreuter & Strecher, 1995). Weinstein (1983, 1984) attributes optimistic and pessimistic biases to cognitive errors in processing risk information, including selective recall, egocentrism and lack of information. Avis, Smith, and McKinlay (1989) suggest that in addition to cognitive errors, there may be specific needs such as self-esteem enhancement or denial as a coping strategy that may interfere with accurate risk perception. Redelmeier et al. (1993), in a review of studies reported in the psychological literature, identify common errors in reasoning that can affect an individual's perception of risk in the clinical setting. Examples of some of the factors that may influence an individual's perception of risk include:

a) the inclination to dichotomously categorise an entity as "safe" or "dangerous" without recognising any gradient of risk,
b) the appeal of eliminating a risk rather than simply reducing a risk,
c) the lack of understanding of statistical probabilities in the context of risk messages (such as absolute or relative risk),
d) memories of past experiences that may be inaccurate and subject to error, and
e) irrational concerns, including folklore or superstitious beliefs.

Other researchers corroborate that the risk messages themselves may be a source contributing to biases in risk perceptions. Lippman-Hand and Fraser (1979) found that individuals have a propensity to dichotomise risk information as a means to integrate complex risk information into decision-making processes. Fischhoff, Bostrom, and Jacobs Quadrel (1993) suggest that health-care providers often confound risk messages by using ambiguous, abstract terminology when delivering the message, and that this may result in biases in risk perceptions.

Specific to pessimistic biases, Sunstein (1998), in a legal discourse of how individuals perceive fatalistic risks, identifies four plausible explanations that may contribute to the formations of pessimistic risk perceptions. First, is the belief that if a risk is especially dreaded, it should deserve special attention. This includes diseases that have a "pain and suffering" toll, such as Acquired Immune Deficiency Syndrome (AIDS) or cancer. Second, because some risks are inequitably distributed, for example HIV infection rates in intravenous drug users, it is not uncommon to afford such occurrences "distributional weight", often over-emphasising these risks as a means to some political end. For example, those who serve as advocates for individuals "at risk" for a specific health-related issue may over-emphasise the issue to call attention to their cause. This type of lobbyist activity may result in a deluge of media information, or alternatively, an inundation of information to policy-makers. The availability of information related to these campaigns may prompt the uninformed to allocate greater weight to the health risk than what is actually warranted. This function of "distributional weight" may not only influence an individual's risk perceptions, but may also be used as a strategy by some researchers to solicit funding dollars for their research efforts (Gross, Anderson, & Powe, 1999).

Third, involuntary risks (such as aeroplane crashes) are typically embraced as more serious than voluntary risks (such as smoking), perhaps because of elaborate rationalisation processes (although there is some debate about what constitutes a true involuntary risk). Fourth, is the issue of control: Is the risk within the control of the individual? Risks that are beyond the control of the individual may be less acceptable or tolerated.

Despite the judicial focus of Sunstein's (1998) work, it offers some useful insight into how risk perceptions may become pessimistically biased. From this work, inferences can be made about possible factors that may contribute to pessimistic biases: (a) degree of pain and suffering involved, (b) the influence of distributional weight, (c) whether or not the risk is considered involuntary, and (d) the perceived controllability of the risk in question.

Risk Perceptions of Healthy Individuals

The literature is replete with evidence that healthy people are optimistically biased in their perceptions of personal risk for cardiovascular disease as well as other threats to health. For example, Avis et al. (1989) found a large percentage of their sample being optimistically biased when they studied the health behaviours and perceptions of risk for MI of 732 healthy individuals with no history of heart disease, diabetes or hypertension who resided in an urban area. A health-risk appraisal tool was self-administered by the participants at baseline and two months later to assess their risk perceptions and health behaviours. In follow-up, at two months, the investigators found the majority of respondents did not alter their risk perceptions, despite the information provided to them after the baseline assessment. Marteau, Kinmonth, Pyke, and Thompson (1995) had slightly different findings after studying how 3,725 individuals who attended cardiovascular screening clinics perceived their risk for cardiovascular disease prior to the screening. Although they found a tendency for their subjects to be optimistic (37%) rather than pessimistic (21%), the researchers also found a strong association between perceived risk for heart disease and levels of individual risk factors, in particular personal and family medical history and body mass index. It is important to note that this study involved a heterogeneous sample of patients who had, and did not have, cardiac disease. The inclusion of both primary and secondary prevention patients may have confounded their findings, because personal history of cardiac disease may prompt more accurate or pessimistic appraisals of cardiac risk. Nesse and Klaas (1994) in a study of 50 patients with anxiety disorders (but otherwise healthy individuals), used matched controls to determine the influence of anxiety on the perceptions of risk for 22 events (including cardiac death). Overall, they found few differences between the patterns of risk estimation of the two groups. In relation to accuracy, they found both groups equally prone to optimistic biases in terms of underestimating their likelihood of common risks and relative risks. This study is useful in that it helps to locate the formulations of risk perceptions outside of the realm of anxiety and within other cognitive processes.

Kreuter and Strecher (1995) identified the perceptions of risk for MI (and other outcomes such as stroke, cancer and motor vehicle accidents [MVA]) in 1,317 adult patients in a primary care setting who were randomly assigned to receive risk information feedback (with or without information on how to change behaviour to reduce risk) or to a no feedback group. Perceived risk was measured at baseline and at 6 months. When compared to actual risk, the respondents' perceived risk for MI was characterised by optimistic biases. Women, African-Americans, younger individuals, and less educated individuals were more likely to have optimistic biases related to their perceived risk for MI. Men and older individuals were more likely to be pessimistically biased about their perceived risk for MI. No intervention effects were found to reduce either optimistic or pessimistic biases for perceived risk of MI. There was, however, an effect from the intervention in reducing optimistic bias for stroke risk and pessimistic bias for cancer risk. Kreuter and Strecher stated that they considered it inappropriate to infer a causal relationship between changes in perceived risk from baseline to follow-up and changes in behaviour occurring at the same time in the intervention groups, although it is unclear why they take this position. They evaluated this in their control groups and found that smokers who had accurate perceptions of stroke risk at baseline were significantly more likely to have stopped smoking at follow-up than those with optimistic biases. They also found that control group patients with pessimistic cancer risk biases at baseline were significantly more likely at follow-up to have seen their physician two or more times in the previous two months than patients who had accurate perceptions of their cancer risk. This may indicate that biases in perceived risk of cancer influences utilisation of health-care services. In reviewing this study, however, one must be aware that other background factors, specifically the health history of the respondents, are not revealed. Previous experiences, either in personal or family history, or other factors, may have influenced the respondents' perceptions of risk for MI, stroke, cancer, or MVA.

Kulik and Mahler (1987) examined the perceptions of MI risk (in addition to risks for health problems including venereal disease, ulcers, cancer and tooth decay as well as other problems such as divorce, suicide, MVA and mugging) of 67 healthy and 43 acutely ill college students (with illness of flu, cold and strep throat). The researchers were interested in whether the presence of illness influenced the perceptions of risk for specific health and other problems. They found that overall the respondents had a tendency to be optimistically biased, but that the experience of acute illness was associated with diminished optimism for health. In general, respondents who were ill also believed that health problems were generally less preventable than the respondents in the study who were healthy. While the researchers mention several caveats about their findings, including the lack of random assignment and acknowledging the remote possibility that the group of ill students had a disproportionate number of hypochondriacs (who may have more often sought health care and felt vulnerable to health problems), one must still consider whether the experience of illness makes one feel more susceptible to other health problems. Despite a greater perceived risk by those who were ill, this was not sufficient to stimulate greater interest in prevention materials perhaps because of depleted energy related to their current illness. Although this study presents interesting findings, generalisability is limited because of the lack of random sampling, the setting, the small sample size, the young age of the participants, and illness being defined by the presence of relatively minor ailments (illness of flu, cold and strep throat), which lack consequence or implications for long-term health.

Weinstein has been involved extensively in studying risk perceptions, predominantly in samples of college students (Weinstein, 1983; 1984; 1987; Weinstein & Klein, 1995), and has determined that individuals, when asked to appraise their risk for specific outcomes, consistently are optimistically biased. Whereas other researchers have suggested that optimistic biases may help to sustain behaviour change (Taylor & Brown, 1988) or to decrease anxiety when little may be done to reduce the risk (Taylor et al., 1992), Weinstein and Klein suggest that in primary prevention, and specifically when the health problem is thought to be controllable by the individual at risk, optimistic biases may be detrimental and interfere with adopting behaviours designed to mitigate risk. Weinstein (1984) identified this "relentless optimism" as a barrier to acknowledging risk and to adopting healthful behaviour.

Studies of risk perception are usually conducted through a comparative risk assessment or an absolute risk assessment using a health risk appraisal (HRA) tool. In comparative risk assessments, individuals are asked to assess their risk in comparison to other individuals (Harris & Middleton, 1994). When comparative risk assessments are used, individuals are consistently found to be optimistically biased; it is not so much that people expect the best for themselves, but more that they expect misfortune to happen to others (Weinstein, 1984). This downward comparison can result in even greater optimism when the comparison target has less relational proximity to the individual (Harris & Middleton; Perloff & Fetzer, 1986). Harris and Middleton suggest that utilising specific targets of comparison (with close relational proximity) may make it more difficult to make downward comparisons and may alleviate comparative biases to some extent.

An absolute risk assessment is done when the individual, guided by an HRA tool, assesses their own risk without comparisons to other individuals or groups. Usually HRA tools include three elements: assessment, estimation of risk, and education, and are often used to communicate risk information (DeFriese & Fielding, 1990). Using HRAs, assessments are completed through questionnaires, estimates of risk of death or disease, based on available epidemiological data, are provided, and educational messages are communicated, indicating ways in which individuals may reduce their risk through modification of lifestyle (Strecher & Kreuter, 1995).

It appears that even when individuals are confronted with objective assessments of their risk using HRA tools to render absolute risk assessments, optimistic biases persist. Avis et al. (1989) examined the relationship between a healthy individual's perceived risk and objectively measured risk for heart disease and found not only did optimistic bias exist, but upon receiving feedback pointing to high risk from the health appraisal instrument, the majority of individuals did not change their risk perceptions; some individuals actually lowered their estimated risk (i.e., became even more optimistic). It is important to note that this study does not state the sample size and reports findings only in relative terms. This raises some question regarding the validity of the findings; however they are consistent with other criticisms pointing to the low efficacy of using HRA instruments to communicate health messages. Despite the proliferative use of HRAs in both primary and secondary prevention settings, there is little evidence to demonstrate that HRAs are successful in cultivating accurate risk perceptions or inducing behaviour change to reduce risk (Strecher & Kreuter, 1995).

A consistent finding in the literature is that "healthy" smokers, when asked about their heart disease risks, recognise that their risk of myocardial infarction (MI) is greater than non-smokers, but still underestimate their actual risk (Boney-McCoy et al., 1992; Lee, 1989; Strecher et al., 1995). Swedish researchers examined the health beliefs of middle-aged men participating in a cardiovascular risk reduction program and found that smokers considered themselves to be at equivalent risk for myocardial infarction or stroke as non-smokers despite knowledge of risk factors (Naslund, Fredrikson, Hellenius, & de Faire, 1996). This European study may not be generalisable to a North American population, although American researchers reported similar findings of smokers underestimating their risk for heart disease (Ayanian & Cleary, 1999).

Demographic factors such as age, sex, or education level may also contribute to the optimistic biases of healthy individuals. Optimistic bias in relation to myocardial infarction risk, stroke risk and cancer risk may occur more frequently in younger, less educated individuals, with women more likely to be optimistic in relation to myocardial infarction and stroke risks, and men more likely to be optimistic for cancer risk (Avis et al., 1989; Folsom, Sprafka, Luepker, & Jacobs, 1988; Kreuter & Strecher, 1995).

A common misperception in our society is that breast cancer surpasses cardiovascular disease as a health risk for women, despite estimations that 1 in 2 women will die of heart disease or stroke, compared to the 1 in 25 who will die of breast cancer (American Heart Association [AHA], 1996; Legato, Padus, & Slaughter, 1997; Pilote & Hlatky, 1995). Women believe that they are as likely or more likely to die of breast cancer than heart disease, with significant numbers of women believing they are unlikely to ever have a myocardial infarction in their lifetime (Legato et al.). As genetic tests become available to screen individuals at high risk for developing certain cancers, the responsibility and challenge for communicating accurate risk information intensify. Individuals who develop their own categorisation for cancer risk based on family history of cancer, personal experience or anecdotal information may be unwilling to modify their level of perceived risk based on empirical, epidemiological or genetic evidence (Pearn, 1973). Lerman et al. (1991) found that perceived susceptibility will prompt women to have screening mammography, however, the women studied often exhibited inaccurate perceptions of their risk for breast cancer, including both optimistic and pessimistic biases. A later study by Lerman, Kash, and Stefanek (1994) demonstrated that women overestimate their actual risk of breast cancer, and other studies share the finding that women who have a first degree relative with a history of breast cancer generously overestimate their own chance for developing breast cancer (Evans, Burnell, Hopwood, & Howell, 1993; Stefanek, 1990).

Some studies have identified a high correlation between optimistic bias and sense of control (Kulik & Mahler, 1987; McKenna, 1993; Weinstein, 1983). It is suggested that the more controllable a risk is perceived to be, the more likely it is to be characterised by optimistic bias; when perceived to be less controllable, individuals generally overestimate their risk leading to a pessimistic bias. This may be especially relevant in primary prevention settings when health problems have not yet appeared (Weinstein & Klein, 1995). It is important to recognise that these studies examining risk perceptions, the implications related to the nature of the risk, and whether the risk is considered controllable, have been conducted in samples of college students and have not included individuals with cardiac disease. Some authors suggest that screening and advice from health-care professionals on how to reduce risk factors for cardiac disease may affect the extent to which individuals believe they have control over their own health by undermining autonomy and increasing dependence on health-care professionals (Marteau, Kinmonth, Thompson, & Pyke, 1996).

It is unclear what, if any, relevance these finding have in relation to the current study, and to people with heart disease, in general. For example, risk perception research in the context of cancer has to date been predominantly conducted on healthy individuals who do not have cancer, and may include other unique factors that may influence risk perceptions such as the availability of genetic testing. Even fewer studies have been conducted on individuals who have heart disease.

There is some discourse in the literature as to how having a family history of heart disease affects a healthy individual's perception of his or her own risk for developing heart disease. Some researchers have demonstrated that a family history of heart disease is associated with pessimistic biases, suggesting that these individuals have more accurate perceptions of this risk for cardiovascular disease (Avis et al., 1989; Marteau et al., 1995). Conversely, other researchers have demonstrated that the unaffected siblings of persons recently hospitalised for a cardiac event at a younger age, despite having some knowledge of risk factors for cardiovascular disease, do not perceive themselves to be at greater risk for a cardiac event (Becker & Levine, 1987). This is an example of a comparative risk assessment resulting in optimistic bias contributing to an inaccurate perception of cardiovascular disease risk.

Risk Perceptions of Individuals with Cardiac Disease

Very few studies have examined the risk perceptions of patients with a personal history of cardiovascular disease. Gaw (1992) examined patients' perceptions of cardiac disease in those undergoing PTCA and found that approximately one half of those interviewed were able to acknowledge specific cardiac risk factors, and no patient was able to identify gender, hypertension, or diabetes as factors possibly contributing to their own cardiac disease. Obesity, smoking and dietary habits were recognised as factors associated with cardiac disease, but more than one third of the patients did not believe that these factors were related to their particular cardiac problems. Older individuals (aged 61-82 years) were the least informed about their disease condition and were not knowledgeable about the reasons for the PTCA. The findings presented by Gaw were from a pilot project to identify problems and concerns facing patients in a large teaching hospital. The generalisability of these findings to other PTCA populations is limited by the study design and the small sample size.

Misperceptions about the PTCA procedure itself are often the result of patients believing that the procedure is a "cure" for cardiovascular disease. This misperception about PTCA flourished after the procedure was first introduced in the 1980's, and was presented as an option less debilitating than coronary artery bypass surgery for the treatment of CAD (Shaw et al., 1986). Factors associated with the PTCA procedure and recovery may contribute to these optimistic biases. Patients remain awake during the procedure, and the procedure itself is relatively painless except for discomfort originating from the femoral puncture site or the duration of bedrest. Patients expeditiously discharged from the hospital are quickly able to resume physical activity levels and accordingly may use "proxy indicators" to estimate procedural risk such as need for anaesthesia, pain, or length of hospitalisation. For example, procedures requiring anaesthesia or a recuperative stay in hospital may be viewed as more serious or risky. Another proxy indicator may be related to the invasiveness of the procedure; a puncture into the femoral artery to accommodate a PTCA catheter may not be considered as invasive as open-heart surgery with a sternal incision. When proxy indicators of procedural risk are absent or minimal, the procedure itself may be perceived to be innocuous and safe.

Zerwic, King, and Wlasowicz (1997), in a qualitative study of individuals with a CAD diagnosis, found that 6% of MI patients (n=65) and 23% of patients undergoing angiography (n=40) did not know any risk factors for CAD; 19% of MI patients and 40% of patients undergoing angiography were unsure about what caused their heart disease. These researchers also found that only two thirds of smokers identified their smoking as contributing to their cardiovascular disease, and very few patients identified hypertension or diabetes as other risk factors for cardiovascular disease. These findings may be confounded by the fact that these individuals had just been confronted by either an acute coronary event (MI) or by a new, definitive diagnosis of CAD. Individuals may not have had the opportunity to consider risk factors in this context.

Although cardiac patients admitted to hospital may be able to identify general risk factors for cardiac disease, when asked to identify what they perceive their own risks to be, most often, individuals attribute the cause of their disease to overwork, stress or other psychosocial causes (Burgess & Hartman, 1986; Farrel, Booth, & Hayburne, 1985; Fielding, 1987; Murray, 1989). Factors such as smoking, diet, and obesity are recognised as general risk factors, but often individuals do not relate these factors to their own disease states. Further, despite having a greater risk for recurrent MI, many MI patients do not consider themselves to be vulnerable for another MI (Burgess & Hartman; Murray; Zerwic et al., 1997).

Risk Perceptions and Behaviour Change

Knowledge about risk factors and individual perceptions of risk are thought to be precursors to the implementation of behaviour changes to reduce modifiable risk. In addition, perceptions of health and benefits of therapy and behaviour are thought to significantly influence compliance (Houston-Miller, Hill, Kottke, & Ockene, 1997), although level of knowledge does not necessarily predict adherence to health-related lifestyle behaviours (Marteau et al., 1995; Shepherd et al., 1997). Health-care policy initiatives that focus on the assessment and modification of risk factors are based on the assumption that an individual's perception of susceptibility and vulnerability leads to preventive action and changes in behaviour (Becker et al., 1977; Cummings, Jette, Brock, & Haefner, 1979; Weinstein, 1983, 1984).

Very few studies have specifically looked at the risk perceptions or perceived susceptibility of patients with known cardiac disease. Even less is known about the factors or determinants that may account for discrepancies in actual and perceived risk. Knowledge of these factors may be useful in identifying and addressing barriers to the adoption of healthful lifestyles and compliance with prescribed regimens.

Summary

The extent of cardiovascular disease has reached epidemic proportions, not only in the absolute numbers of individuals at risk for cardiovascular disease, but also the ensuing impact on our health-care system and the economic infrastructure of our society. One of the simplest, most efficient, cost-effective strategies to address this crisis, cardiovascular risk reduction, is poorly understand in the clinical setting, and may be under-utilised or misdirected by nurses and other health-care providers. More important, individuals at risk may fail to accurately perceive their risk and threats to their health, and consequently miss opportunities to act to reduce their likelihood of developing or advancing the progression of cardiovascular disease. The studies reviewed indicated that individuals may be biased in their risk perceptions, either optimistically or pessimistically, and these biases may interfere with the ability to implement and maintain healthful lifestyle behaviours. Numerous studies indicated that most often, optimistic biases prevail in healthy individuals, but the experiences of patients with CAD are poorly understood.

The few studies undertaken to explore the risk perceptions of individuals with cardiovascular disease have been limited by small samples and methodological issues, and focussed primarily on recognition of risk factors. Studies exploring risk perceptions in relation to the extent of cardiovascular disease or correlates of risk perceptions were not found. It is apparent that further study of this phenomenon is necessary to develop a greater understanding of the personal experience of living with cardiovascular disease.

CHAPTER 3: METHODS

Theoretical Background

Further study is required to explore risk perceptions in the context of cardiovascular disease. Specifically, there is a need to better understand the intricate relationships between risk perceptions, cardiac disease knowledge, and lifestyle behaviours. It is well documented that risk reduction is an established intervention, proven to be a safe, efficacious, and cost-efficient strategy to reduce an individual's risk for the development or progression of cardiovascular disease (Pearson & Fuster, 1996). The first step in reducing cardiovascular risk may be to improve the individual's ability to recognise risk factors (Silagy et al., 1993; Zerwic et al., 1997) and understand the relevance of risk factors in the context of their personal situation. Understanding how individuals perceive their risk for cardiovascular disease and knowing the factors that contribute to inaccurate perceptions of risk would provide useful information for health-care providers working with "at risk" individuals.

The theoretical background guiding this study is based on the Health Belief Model (HBM) (Becker & Levine, 1987; Rosenstock, 1974). This theory suggests that individuals are not likely to take on a health action unless they believe that: (a) they are susceptible to the disease in question, (b) the disease would seriously affect their life, (c) certain actions can reduce the likelihood of disease or reduce its severity, and (d) taking the action is not as great a threat as the threat that is implicit in the disease. The present study does not test all of these four aspects of the HBM, but rather the core component related to disease susceptibility.

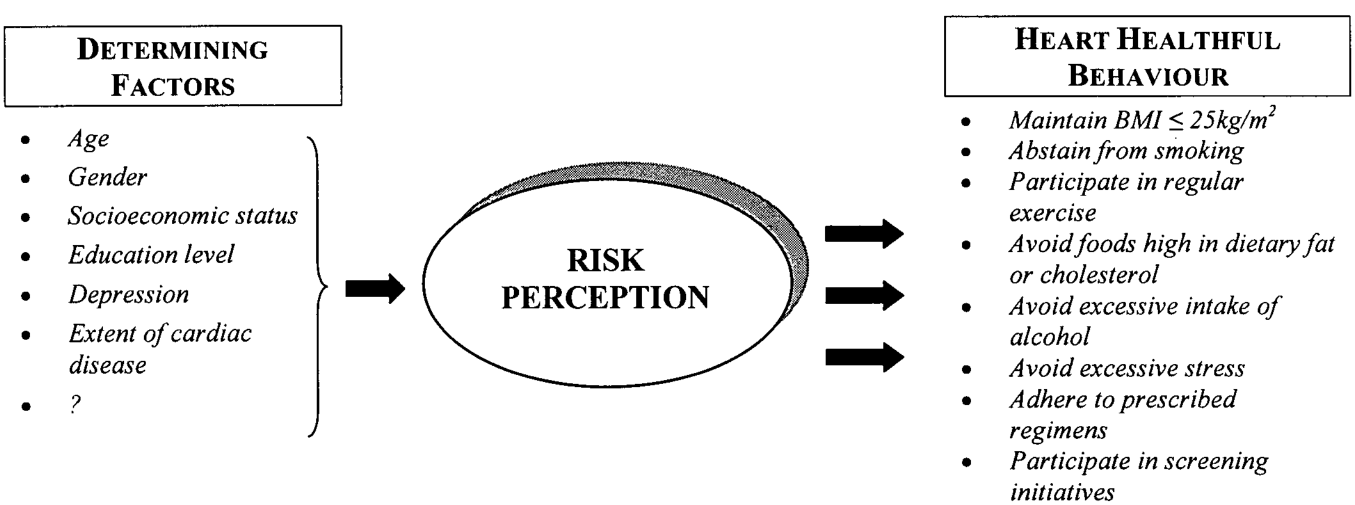
The definition of the word "susceptibility" includes *"...likely to be affected by, prone or vulnerable to; vulnerable, esp. deficient in defences against a disease..."* (Barber, 1998, p. 1461). Risk perception, for the present work, is defined as *"the interpretations or impressions of the possibility or chance of threats or specific, adverse consequences or outcomes. Risk* *perceptions are subjective and are influenced by an individual's knowledge, beliefs and experiences"*. Hence the term "risk perception" is a broader term that encompasses disease susceptibility and also incorporates the elements of probability or chance. Further, this definition of risk perception also recognises that there are antecedent factors or determinants of risk perception. The HBM is useful to help us locate how risk perception fits into our broader understanding of health behaviour and adoption of healthful lifestyle behaviour. Using this theoretical background, an individual's readiness to adopt healthful lifestyle behaviours is determined, at least in part, by their perceived susceptibility to the disease or condition if the current lifestyle is maintained, and of the potential consequences if the disease or condition in question is acquired.

It is recognised that perceptions of risk extend beyond the mere recognition of susceptibility to a disease process, and although the HBM provides a theoretical basis for the study, it does not go far enough to help us elucidate the factors influencing the formation of risk perceptions. The HBM fails to explain what determines susceptibility or sense of risk. Further, the HBM suggests logical and rational cognitive processes whereas perceptions of risk for disease progression and death may be neither logical nor rational and are prone to optimistic and pessimistic biases.

One may argue that the HBM is unsuitable to provide a theoretical link between risk perceptions and behaviour change. However, the conceptualisation that risk perceptions drive an individual's behaviour is emerging as an important aspect of contemporary literature studying the concept of risk perceptions and risk communication messages. For example, Frewer (1999) suggests that an individual's behaviour is dictated more by their perception of their risk rather than technical risk information. In order to move this area of research forward, Frewer also suggests that risk perception research must move beyond the predominantly psychometric paradigm and examine the social context in which risk information messages are embedded. To accomplish this, new methodological techniques may be required to explore and understand the constituents of risk perception, including the psychological and social determinants.

Whereas it is acknowledged that elaborations of the origins of risk perception are lacking in the literature, the literature review conducted for this study (see Chapter 2) reveals some of the factors that seem to be associated with the formation of risk perceptions. These include age, gender, socioeconomic status, education level, psychological factors such as depression, and experience with the disease in question either by personal or family history. These, and other as yet unidentified factors appear to be antecedent determinants contributing to the formation of risk perceptions (including susceptibility to disease) which influence the adoption of healthful lifestyle behaviours (see Figure 1).

Figure 1. Theoretical Background



Very little is known about the differential effects of risk perception on behaviour. That is, how extremes of risk perceptions (including optimistic and pessimistic biases) influence an individual's likelihood to adopt specific lifestyle behaviours to mitigate their disease risk.

Summary of Research Project

This study examined how individuals with heart disease perceived their risk for cardiovascular disease progression and death. These perceptions were compared to objective assessments of risk relative to the severity of their heart disease. This comparison between subjective and objective estimations of risk made it possible to derive an estimate of the level of accuracy, rendering the subjective risk perceptions to be accurate, or optimistically or pessimistically biased. Further, associations between those factors that were identified as potential antecedents to subjective risk perceptions were explored. Finally, the consequences of the risk perceptions, namely the presence or absence of healthful lifestyle behaviours, were also examined in relation to the level of accuracy of the risk perceptions.

Research Design

Elective PTCA patients were selected for this study because they all had an established diagnosis of CAD prior to the time of their angioplasty, and were clinically stable enough to be considered for an elective, rather than urgent, PTCA. Risk perceptions may develop over a period of time, therefore it was important to acknowledge the duration of CAD diagnosis. For example, patients admitted for acute MI undergoing PTCA may not have had the same opportunities to consider their diagnosis of CAD as someone who had been waiting three months to have the procedure done, and this difference may contribute to biases in risk perception.

It was anticipated that some of the PTCA patients in this study would have inaccurate perceptions of their risk factors for cardiovascular disease. Consistent with published research findings, it was estimated, a priori, that some of the PTCA patients in the study would be optimistically biased, while other patients, based on previous experience or positive family history, would be more pessimistic in their assessments of their risk of cardiac disease progression and death. Inaccurate perceptions of risk of disease progression and death were identified by a comparison of the PTCA patient's perception of his or her risk for cardiac disease progression and death and an objective appraisal of his or her risk of adverse cardiac outcomes, as well as a conventional cardiovascular risk factor assessment.

According to the theoretical background for this study, it was conceivable that inaccurate risk perceptions, whether optimistically or pessimistically biased, could increase the likelihood that recommended lifestyle behaviours to reduce cardiovascular risk would not be implemented. To address this, each PTCA patient in this study was assessed in relation to current lifestyle behaviours aimed at maintaining heart health, such as monitoring weight, eating low fat/cholesterol foods, exercising regularly, taking medications as prescribed and maintaining smoking abstinence.

The design of this study was a cross-sectional, correlational design. All participants were administered a questionnaire containing demographic items, items pertaining to knowledge of cardiovascular disease, perceptions of risk of progression of cardiovascular disease and death, presence of cardiovascular risk factors, and the presence of healthful lifestyle behaviours. Additional data were collected for each patient from a review of their hospital record, and thus, data collection for this study included both self-reported and objective information. The setting for this study was the Cardiac Intervention Unit (CIU), a short-stay pre/post-PTCA unit, at St. Paul's Hospital in Vancouver, British Columbia.

Study Protocol

A Research Assistant (RA) was hired and trained by the investigator to recruit subjects, administer the questionnaire and complete data collection in a nonbiased, systematic manner. Each day that elective PTCAs were performed at St. Paul's Hospital (Monday to Friday), all patients listed for the procedure were identified and screened for eligibility. Once the patient was deemed clinically stable post-PTCA, with the effects of sedation diminished, the RA approached the patient at the bedside to obtain consent and to administer the data collection tool. All participants were to be interviewed face-to-face following their PTCA procedure, before discharge. Once data collection was completed, subjects were thanked for their participation.

Sample

The population for this study included both men and women. Patients undergoing PTCA were first approached by their nurse or cardiologist to assess their interest in participation in this study. If the patient wished to participate in this study, or expressed interest in learning more about the study, the RA visited the patient, explained the study, obtained consent if the patient was willing, and proceeded with data collection. Inclusion criteria were that the patient had documented CAD prior to the PTCA and was clinically stable enough to be admitted to CIU post-PTCA. Exclusion criteria include patients undergoing emergency PTCA for treatment of acute MI, lack of English comprehension, and failure to consent.

The study population was defined as all elective PTCA patients at St. Paul's Hospital from April 1, 1999 to July 30, 1999. Every individual in the population was to be approached for participation in the study, which obviated the need for elaborate sampling schemes or actual sample size calculations. Non-response of some individuals was expected but was not anticipated to interfere with the study unless a large number of non-responses were accrued. Eight to nine hundred PTCAs are performed annually at St. Paul's Hospital, so it was feasible to expect to obtain a sample of 300 participants within four months. Although a population-based approach was taken and every potential subject was approached, we are accustomed to completing and interpreting inferential statistics even in the case of a population-based approach. Consequently, we examined some a priori analyses of power assuming medium sized effects, alpha=.05 (2-tailed) and statistical power of 80%. For a t-test for means, 128 cases would be required to meet these conditions (Erdfelder, Faul, & Buchner, 1996). Similarly, to estimate a binary split of 50% and 50% with 95% confidence, one would require 133 cases to ensure a maximum error of ± 8.5% (Decision Analyst, 1998). Using Pearson's correlation coefficients, one would require only 84 cases to detect a moderate correlation of .30 or greater. Finally, for the Chi-square analyses with two degrees of freedom (e.g., sex by level of accuracy), 80% power with a medium-sized effect would require 154 cases (129 cases would produce 70% power). Needless to say, contingency tables with additional strata would require more cases to achieve similar levels of statistical power. A Chi-square analysis with four degrees of freedom would require 183 cases to achieve 80% power to detect a medium-sized effect. This study with 134 cases likely produced power of 60% for this type of analysis (Cohen, 1988).

Instrumentation

The research took on the complex task of measuring the respondent's perceptions of cardiovascular disease severity and chance for disease progression and death. In an effort to identify the correlates of these perceptions, included was an evaluation of the presence or absence of healthful lifestyle behaviours for each respondent (diet, exercise, smoking, weight management), as well as items pertaining to knowledge about cardiac disease, cardiovascular risk factors (dyslipidemia, hypertension, diabetes) and PTCA procedures, an estimation of functional class, an assessment of depression and sociodemographic variables. Established instruments were used to objectively estimate 5-year survival and 1-year mortality, and chance for cardiovascular disease progression. To efficiently collect data, a comprehensive questionnaire was developed for this study (see Appendix A). The data collected represents a combination of self-reported and objective information.

Risk perception.

The literature did not reveal any tool or questions requiring respondents to estimate their disease severity or chance or likelihood of progression of disease or death, which made it necessary to develop these items to address the needs and purpose of the present study. The items developed include perception of cardiac disease severity (item #18 on the questionnaire), chance for cardiac disease progression (item#19) and chance for cardiac death (item # 22). Respondents were asked to estimate their cardiac disease severity using a scale ranging from 0 (meaning "not at all severe") and 10 (meaning "very severe"); and their chance for cardiovascular disease progression and death in the next year, the next 5 years, and ever in the future by providing estimates using a scale ranging from 0% (meaning that there was absolutely no chance) to 100% (meaning that it was an absolute certainty). Development of these items followed the path outlined by Mishel (1998), including using personal judgements, discussions with clinical colleagues, and consultation of relevant literature. The paucity of relevant items or tools in the literature made it infeasible to formally establish the reliability and validity of these developed items, although other researchers have asked questions pertaining to risk perception posed as percentage probabilities (Lerman et al., 1996). Face and content validity of the developed items were determined by experts in the area of cardiovascular nursing to decide on the relevance of the content to the concept of risk perception. Using face and content validity has been used by other health researchers to confirm the validity of questions pertaining to perceptions of risk for contracting AIDS (Lollis, Johnson, & Antoni, 1997). While it is acknowledged that face validity is a weak form of validity, it does offer some insight into the usefulness of the items. Pilot testing of these items was done which confirmed the scales used for these items were easy to work with and easily understood by respondents.

Presence or absence of healthful lifestyle behaviours.

Several questions were asked to ascertain the presence or absence of healthful lifestyle behaviours such as adherence to a low fat diet or regular exercise program, abstinence from smoking, and weight management. Information on these variables was collected using a variety of question formats. For example, respondents were asked: (a) general questions about the behaviours they adopted to reduce their cardiovascular disease risk; (b) specific questions about the behaviours they used to manage the risk factors of dyslipidemia, diabetes and hypertension; and (c) direct questions about diet, exercise, smoking and weight management. Direct questions were used to determine the congruency of responses regarding lifestyle behaviours.

Dietary Fat and Cholesterol Intake. The Northwest Lipid Research Clinic Fat Intake Scale (NWLRC) is a 12-item instrument used to screen and monitor dietary fat intake in relation to plasma cholesterol levels (Retzlaff, Dowdy, Walden, Bovbjerg, & Knopp, 1997). Reliability and validity data for this scale include two-week test-retest correlation coefficients of .88 for men and .90 for women and correlation coefficients of .47 - .64 ($p < .001$) when correlated with fat consumed (grams per day) from 4-day food records. The instrument demonstrates acceptable reliability and validity for the estimation of intake of foods high in fat, saturated fat, and cholesterol. The reliability and validity of this scale is consistent with other scales used to evaluate dietary fat exclusive of actual food record analysis. This specific scale was selected because it is easy to administer in the clinical setting. Items #55-66 in the questionnaire pertain to the NWLRC tool.

Exercise Patterns. Items were developed to assess frequency of exercise, time spent exercising and type of activities done for exercise (items # 67-70). These items were used to estimate the respondent's weekly caloric expenditure. To facilitate purposeful analysis of these data, it was important to estimate or quantify a minimal level of caloric expenditure for respondents who stated they "never exercised", rather than simply describe their caloric expenditure as "0". These sedentary individuals were allocated an approximate weekly caloric expenditure based on 10 minutes of low-intensity (i.e., 2.5 METS) activity three times each day, which is consistent with an average person conducting activities related to daily living (Dafoe, 1993).

Smoking History. Items related to smoking history were taken from Canada's National Population Health Survey (1999) to evaluate smoking history (items #50-52) with additional items developed to identify smoking cessation intentions (items #53-54).

Weight Management. Items related to weight management were taken from Canada's National Population Health Survey (items #41-43). To calculate body mass index (BMI), respondents were asked to estimate their height and weight (items #71-72).

Cardiac knowledge.

Cardiac Disease. Respondents were asked several questions pertaining to their knowledge of cardiac disease (items #7-13) and their personal cardiac history (items # 14-17). These items were developed for use in the study, and were self-reported variables. Objective information about the respondent's cardiac disease history was collected from a review of the chart record (item #103).

Cardiovascular Risk Factors. Patients were asked several questions about cardiovascular risk factors in general and also specific to their situation. These questions were explicitly worded, requiring the patient to recall information rather than to recognise information from a list of options. Information was collected as to whether conventional cardiovascular risk factors were "mentioned" or "not mentioned" by the patient. In addition, information was collected on other factors viewed by the patient to be "risk factors" (such as alcohol consumption, overabundance of dietary fat, obesity, and stress). Several questions were developed for the study, relating to the risk factors of family history of cardiac disease (items #20-21), dyslipidemia (items #38-40), hypertension (items #44-46), and diabetes (items #47-49). These were self-reported variables. A chart review was conducted to determine the cardiovascular risk factors identified in the medical record (item #94).

PTCA Procedure. Specific questions were asked of the respondents to understand what they viewed to be the anticipated outcomes following their PTCA procedure (items #1-2). In addition, the patients were asked procedure-related information to gain insight into how well they understood the PTCA procedure itself (items #3-4, 6). Finally, patients were asked to estimate the probability or likelihood that they would require a repeat PTCA in the future (item #5). These were all self-reported variables; objective information pertaining to the PTCA procedure including number and location of lesions dilated and pre- and post-PTCA estimations of lesion severity was also collected (item #97).

Functional class.

The Specific Activity Scale (SAS) (Goldman, Hashimoto, Cook, & Loscalzo, 1981) was selected to estimate the functional capacity of the patients participating in this study. Tests of reliability and validity for the SAS tool were conducted by Goldman et al. who found the inter-rater reliability of the SAS to be 73%, which was equivalent to the estimation of functional class according to the "gold standard" Canadian Cardiovascular Society (CCS) classification system (inter-rater reliability of 73%), and greater than the New York Heart Association (NYHA) classification (inter-rater reliability of 56%). Further, Goldman et al. found that in validity testing, the SAS agreed with the exercise treadmill performance 68% of the time, which was greater than both CCS and NYHA classifications (validity of 59% and 51%, respectively). In comparing the three classification systems (CCS, NYHA, and SAS) Goldman et al. found the SAS had the strongest correlation with the duration of treadmill exercise ($r = -0.66$) which is a standard prognostic indicator in the context of CAD. The SAS was equally reproducible and valid when administered by non-physicians. Item #73 in the questionnaire pertains to the SAS.

Depression.

The Geriatric Depression Scale (Short Form) is a 15-item scale used to screen for major depression in older patients (Lyness et al., 1997). Using the cut-points of 4/5, the GDS has a positive predictive value of 82.6% and a negative predictive value of 83.3% compared with the diagnosis of clinical depression made by psychiatrists (Almeida & Almeida, 1999). The GDS was specifically selected for data collection because the "yes or no" format renders the scale easy to administer in the clinical setting. For the present study, we sought a simple tool to identify depression that would be easy to administer and unobtrusive in light of the other questions required by this study. Although some might query the use of a "geriatric" scale, it appears that the title of this tool may be misleading because it has concurrent validity with other depressive scales used in the general population (Scogin, Beutler, Corbishle, & Hamblin, 1988). Use of the Geriatric Depression Scale also favours more accurate assessment of depression in subjects of this study population who were 60 years of age or older. Other tools that evaluate somatic symptoms pertaining to depression may overestimate the prevalence of depression in geriatric populations because older adults are more likely to report on the somatic (anorexia, sleeping disorders, etc.) rather than the introspective aspects of depression (Diefenbach, Leventhal, Leventhal, & Patrick-Miller, 1996). Items #23-37 in the questionnaire pertain to the GDS.

Sociodemographic variables.

Sociodemographic variables were collected with well-established survey questions; many of which are now standardised in Canada. Items included pertain to cultural background (#78-79, 86), educational background (#80-83), marital status (#84), employment and vocation status (#85, 93), estimated total household income (#87), total number of household members (#88), birthdate and age (#89, 91), and gender (#92).

Objective estimate of five-year survival.

A nomogram (developed by Califf, Armstrong, Carver, D'Agostino, & Strauss, 1996) integrating several clinical parameters was used to objectively estimate 5-year survival (see Appendix B). Items for each clinical parameter were included on the data collection tool in order to complete the nomogram and to produce an estimate of 5-year survival. The items used include age (item #91), gender (item #92), ejection fraction (item #100), angina score (item #99) that allocates points relative to the severity of symptoms ranging from stable angina (4 points) to post-myocardial infarction angina (31 points), mitral regurgitation (item #101), any history of heart failure (item #102), any history of vascular disease including any trans-ischaemic attacks, cerebral vascular accident, peripheral vascular disease, or thromboembolic events (item #104), and any co-morbidity including history of malignancy, renal insufficiency or failure, lung disease such as asthma/chronic obstructive pulmonary (item #105), diabetes or hypertension (item #94). Finally, angiographic information about the respondent's coronary anatomy, specifically lesion location and severity (item #96) was used to complete the Coronary Artery Disease Prognostic Index (Mark et al., 1994; see Appendix C), an essential component of the nomogram score. This index takes into account the affected coronary artery or arteries, the location of the lesion within the artery (e.g., proximal vs. distal disease) and severity of the lesion (0 – 100%) to render a prognostic weight ranging from 0 – 100%. The prognostic weighting is based on a "jeopardy score", which estimates the amount of myocardium that is jeopardised or at risk because of the location and extent of coronary artery stenosis (Califf et al., 1985).

Despite personal communication with the primary author of this nomogram, it is unclear if this nomogram has been used either in clinical practice or for research purposes. To establish validity of this tool to estimate 5-year survival, it was reviewed by several clinical cardiologists at St. Paul's Hospital, who all confirmed the utility of the tool for its intended purpose. Further, all of the cardiologists confirmed the authors of this nomogram are well recognised for their excellence in clinical research related to cardiovascular disease which, in their minds, enhanced the credibility of the nomogram.

Estimated risk of mortality at one-year.

Selected clinical variables were used to estimate risk of mortality at one-year according to the criteria set by Califf et al. (1996) (see Appendix D). The clinical variables used included age (item #91), angina score (item #99), mitral regurgitation (item #101), diabetes (item #94), hypertension (item #94), prior MI (item #103), and cerebrovascular or peripheral vascular disease (item #104).

Cardiovascular disease progression.

A tool developed by Roitman, LaFontaine, and Drimmer (1998) (see Appendix E) was used to stratify the respondents, based on clinical variables, into low, moderate or high-risk categories for progression of atherosclerosis. The clinical variables used to derive the cardiovascular disease progression score include smoking (item #50-52), dietary fat and cholesterol defined by the NWLRC score (items #55-66), diabetes (item #94), hypertension (item #94), depression as defined by the GDS score (items #23-37), exercise expenditure per week (calculated from items #67-68, 70), and BMI (calculated from items #71-72).

Accuracy of perceived risk for cardiovascular disease progression and death.

As mentioned above, respondents were asked to state what they thought their chance to be for death due to cardiovascular disease in the next year, the next five years, and ever in the future by using a scale range of 0% (meaning that there was absolutely no chance) to 100% (meaning that it was an absolute certainty). To assess the accuracy of these estimates, the subjective perceptions of risk for death were compared to the objective score estimating 5-year survival (Califf et al., 1996). Similarly, respondents' subjective estimates for cardiovascular disease progression in the next year, the next five years, and ever in the future were compared to the objectively estimated cardiovascular disease progression score (by Roitman et al., 1998). To determine the level of accuracy, the subjective risk perceptions were described as: (a) "accurate" if there was reasonable agreement between the subjective perception and the objective score, (b) "optimistic" if the subjective perception underestimated the risk of death relative to the objective score, and (c) "pessimistic" if the subjective perception overestimated the risk of death relative to the objective score.

Summary of instrumentation.

The tool for data collection represents items from established tools as well as items developed to answer the research questions posed by this study. A decision was made to include a few questions to collect data on potentially relevant variables. Because of the exploratory nature of the study, it was unclear what utility, if any, these variables would have in helping us to understand the factors contributing to risk perceptions. Further, the addition of these few items may prove useful in future efforts to maximise the use of the data-set beyond the original purpose of this study. With this in mind, data were also collected on the following variables: Alcohol consumption (items # 74-77) were adapted from World Health Organization Health Interview Surveys (WHO, 1996), geographic location of residence according to Postal Code (item #90), blood pressure assessment (item #95), serum laboratory data including total cholesterol, LDL-cholesterol, HDL-cholesterol, triglycerides, glucose, glycosylated haemoglobin, haemoglobin, and creatinine (item #98), other medical history (item #106), and current medications (item #107).

Data Quality

Every effort was made to eliminate any potential source of systematic or random error in this study. Random error was kept to a minimum by having the RA well prepared and aware of her pivotal role as a data collector, and included role playing before data collection commenced to prepare the RA for transient personal or situational factors that could arise. Other factors that may have contributed to random error included the physical environment, level of pain or discomfort experienced by the respondent, and issues related to privacy. Particular care was taken during data collection to ensure these sources of random error were kept to a minimum. Equal efforts were undertaken to minimise constant errors such as social desirability and acquiescence response sets.

Because of the exploratory/descriptive nature of this study, there was a great reliance on the reliability of the data collection tool. Validity of the data collection tool was based primarily on face validity and content validity for the items not taken from other instruments. Pilot testing of the data collection instrument revealed that questions were readily answered by respondents without hesitancy or need for clarification.

Ethical Considerations

The Ethics Committees of the University of British Columbia and St. Paul's Hospital reviewed this study. Every effort was made to protect the patients who agreed to participate in this study. Participants were informed of the purpose of the study, that their participation was strictly voluntary, and that they were free to withdraw from participation in the study at any time without threat, penalty, or interference with their clinical care. Study participants were provided with a signed, witnessed copy of their consent to participate. Anonymity of the study participants was maintained at all times, all data organised with subject codes, and all identifiable information was secured in a locked file. In the event that study participants asked questions about their cardiovascular health, all answers were provided to the best of the investigator's ability after data collection was complete. At that time, if outstanding information was required by the study participants regarding their cardiovascular status or any other issue pertaining to their health and well being, referrals to other health-care professionals or services were appropriately made.

CHAPTER 4: ANALYSIS AND RESULTS

In the original design of the study, data were to be collected from consecutive patients recovering from a PTCA procedure in the Cardiac Intervention Unit (CIU) at St. Paul's Hospital, Vancouver, British Columbia, between April 1 and July 30, 1999, inclusive. Because of a severe nursing shortage in CIU during the study period, St. Paul's Hospital limited the number of elective PTCA procedures performed. Further, an administrative decision was made to close the CIU at night and on weekends, which required all patients to be discharged or transferred to another in-patient unit by 1930 hours each day. As a result of these decisions, a very narrow margin of time existed between post-PTCA recovery and the expedient transfer and discharge of patients to accommodate study enrolment. Consequently, there was marked reduction in the number of PTCA patients available for study enrolment.

To compensate for these administrative decisions and their impact on enrolment for the study, an amendment to the original protocol was devised for which ethical approval was granted. The amended study protocol accommodated two modes of data collection: the first mode as described in the original protocol (see Chapter 3) and a second mode, involving telephone interviews of eligible patients who had not been approached in hospital after their PTCA because of clinical instability, early discharge, or transfer from CIU.

Efficiency of Sampling

The total number of CIU patients undergoing PTCA procedures between April 1 – July 30, 1999 and details pertaining to recruitment and enrolment to the study for both the face-to-face and telephone interviews are shown in Table 1. The two modes of data collection resulted in a range of response rates, rather than a single value. Reporting the range of response rates rather than a single value more accurately describes the rate of response in survey research

(Fowler, 1993). The range in response rates for this study varies, depending on the values used for the numerator and denominator (see Table 2).

Table 1

Recruitment and Enrolment of Subjects

	Face-to-face n (%)	**Telephone** n (%)	**Total**
Potential subjects	125	121	**246**
Returned consent forms	N/A	48 (39.7)	
Ineligible	16 (12.8)	9 (18.8)	**25**
• *Not fluent in English*	*9*	*1*	
• *Cognitive impairment*	*2*	-	
• *Not a resident of B.C.*	*5*	-	
• *No telephone*	*N/A*	*3*	
• *Hearing impaired*	-	*3*	
• *Died after discharge*	*N/A*	*2*	
Declined	8 (7.3)	6 (15.4)	**14**
Enrolled	101 (92.7)	33 (84.6)	**134**

Table 2

Response Rates

Type of Rate	Comparison	Numerator/ Denominator	Rate (%)
Efficiency of in-hospital contact	Patients approached in hospital/ total number of patients	125/246	50.8
Efficiency of consent of discharged patients	Consent forms returned / total number consent forms mailed	48/121	39.7
Gross enrolment rate (liberal estimate)	Number of patients enrolled/ all patients	134/246	54.5
Actual enrolment rate (conservative estimate)	Number of patients enrolled/ all possible patients	134/173	77.5

The data collected for this study may be divided into two groups: interviews conducted "face-to-face" and interviews conducted by telephone. Initial data analyses explored whether any differences existed between the two groups in terms of their general background (age, gender, marital status, amount of exercise, and depression score) or key variables (prognostic indicators such as mortality and morbidity scores, number of lesions, and risk perceptions relating to disease severity, disease progression and death). Variables that were likely to share similar distributions in both groups, because they were unlikely to be associated with data collection method (such as fat content in diet and body mass index), were not included in these preliminary analyses. Table 3 provides t-tests conducted on continuous data to determine differences between the groups based on type of interview. Table 4 provides cross-tabulations and chi-square analysis results for binary and nominal data to determine differences based on the type of interview.

Table 3

Comparisons of Means of Patient Attributes by Interview Type

	Interview Type		
Variable	**Face-to-face** **M (SD)** n=101	**Telephone** **M (SD)** n=33	**t (*df*)**
Year first diagnosed with CHD	1994 (7)	1993 (9)	0.92 (132)
Number of visits to hospital	1.6 (2.0)	1.2 (1.7)	0.96 (132)
Total household income[a]	5.4 (3.2)	5.5 (3.6)	-0.08 (116)
Age (years)	61.0 (9.8)	69.4 (10.0)	-4.21 (132)***
Level of education[b]	9.3 (3.5)	9.9 (3.5)	-0.96 (132)
5-year survival score (%)	83.1 (18.7)	74.7 (25.6)	1.73 (43.7)[§]
1-year mortality score (%)	4.2 (4.9)	7.7 (9.2)	-2.10 (38.1)[§]*
Estimated ejection fraction	55.8 (12.5)	55.9 (12.1)	-0.06 (88)
Specific Activity Scale[c]	1.6 (0.9)	1.6 (0.7)	-0.02 (132)
Total number of lesions dilated	1.9 (1.1)	1.8 (1.1)	0.29 (132)
Reported Risk Perceptions:			
Disease severity	5.4 (2.9)	4.9 (2.9)	0.76 (107)
Chance needs future PTCA…			
…In next year (%)	14.0 (22.2)	24.2 (36.2)	-1.42 (33.4)[§]
…In next 5 years (%)	28.3 (29.2)	36.5 (37.1)	-1.19 (111)
…Ever again in the future (%)	44.4 (34.5)	41.4 (39.9)	0.37 (107)
Chance of CHD death…			
…In next year (%)	6.3 (14.9)	12.3 (24.7)	-1.27 (37.7)[§]
…In next 5 years (%)	13.9 (19.8)	24.9 (35.1)	-1.59 (32.8)[§]
…Ever in the future (%)	43.9 (37.8)	50.0 (45.8)	-0.59 (33.6)[§]

[a]16 people declined to answer; Mean annual income for both groups between $41,000-$51,000. [b]Level 9 = 12 years of elementary and high school combined. [c]Functional Class I – II.
[§] Unequal variance t-test used.
*$p \leq .05$ **$p \leq .01$ ***$p \leq .001$.

Table 4

Comparisons of Binary Variables of Patient Attributes by Interview Type

	Interview type		
Variable	**Face-to face** n=101 (%)	**Telephone** n=33 (%)	χ^2 (df) [a]
Gender: female	19 (18.8)	12 (36.4)	**3.38 (1)**
Marital status: no partner	23 (22.8)	8 (24.2)	**0.00 (1)**
Smoked in past 5 years	29 (28.7)	2 (6.1)	**5.96 (1)***
Pattern of Angina			**0.20 (2)**
Asymptomatic/stable angina	29 (28.7)	10 (30.3)	
Progressive/unstable angina	60 (59.4)	20 (60.6)	
Post – MI angina	12 (11.9)	3 (9.1)	
Depression (GDS score ≥ 5)	25 (24.8)	4 (12.1)	**1.66 (1)**
Never exercises	37 (36.7)	10 (30.3)	**0.20 (1)**

[a]Yates' Continuity Correction applied to all 2 x 2 tables.
*$p \leq .05$.

These data suggest that those interviewed by telephone were slightly older (mean age 69.4 years vs. 61.0 years), had, on average, higher 1-year mortality scores (7.7% vs. 4.2%) and were less likely to have smoked in the past five years. Although a difference in 1-year mortality scores was found between the groups, this was not confirmed with the more sensitive 5-year survival scores. The face-to-face interview group contained more former smokers, which is consistent with there being more men in this group.[1] Although not statistically significant, one third of the telephone-interviewed group was female, but only 23% of the entire study population was female.

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[1] In 1996/97, among Canadians aged 55 years and older, 22% of men were current smokers compared to 16% of women. Similarly, in British Columbia, in 1997, 48% of men aged 45 to 64 years were former smokers compared with 38% of correspondingly aged women. The gender difference is even greater for British Columbians older than 65 years (Angus Reid Group, 1997; Health Canada, 1999, January).

Multivariate analysis was conducted to examine the relationships between the variables listed in Tables 3 and 4 and type of interview. Stepwise logistic regression was used with forward entry based on the Wald statistic (probability of entry ≤ .05 and probability of removal ≥ .10). Two variables entered the model: number of visits to hospital (OR = .74; 95% C.I. = .56 - .99) and age (OR 1.11; 95% C.I. = 1.05 - 1.18). This may indicate that older patients were more heavily sedated or clinically unstable and thus were viewed as inappropriate for enrolment on the day of the procedure. It is more difficult to speculate why number of hospitalisations also entered the model. This may be an indication of acuity, although none of the other measures of disease severity entered the model (i.e., 5-year survival score, 1-year mortality score, and number of lesions dilated). These differences did not raise concerns about the pooling of the respondents for the analysis given the purpose of the study.

Characteristics of the Participants

The average age of the respondents, at the time of their PTCA, was 63 years (SD = 10.5, range 36 – 88 years). Other demographic information pertaining to sex, marital status, educational attainment, annual income and occupation are included in Table 5. Because of the range of ethnic backgrounds anticipated in this study (as a result of the ethnic diversity of Vancouver) patients were asked to describe their ethnic origin and country of birth. In examining these data, it is interesting to note that study participants did not always associate their ethnic background with their country of birth. For example, of the 99 patients born in Canada, only 9 considered their ethnic background to be "Canadian." Further, 34 (25.4%) of the patients described their ethnic background as "none" or "do not know," and 3 (2.2%) identified their ethnicity by non-racial or non-regional terms (e.g., "Alcoholics Anonymous") or by religious denomination (e.g., "Baptist").

Table 5

General Characteristics of PTCA Patients

Characteristic	**Frequency (%)** N = 134
Sex	
Male	103 (76.9)
Female	31 (23.1)
Marital Status	
Now married	96 (71.6)
Common-law/live in partner	7 (5.2)
Single (never married)	8 (6.0)
Widowed/separated/divorced	23 (17.2)
Educational Attainment	
< High school graduate (6 – 11 years of elementary/high school)	25 (18.7)
High school graduate	14 (10.4)
Incomplete post-secondary education	49 (36.6)
Post-secondary certificate or diploma	28 (20.9)
Baccalaureate or Master's degree	15 (11.2)
Degree in Medicine, Chiropractics, Optometry, Veterinary Medicine	3 (2.2)
Occupation	
Trades/technical/labour	19 (14.2)
Clerical/sales	5 (3.7)
Professional/manager/self-employed	16 (11.9)
Disability/unemployed	5 (3.7)
Retired	87 (64.9)
Not stated	2 (1.5)
Total household income (before taxes)	
$20,999 or less	20 (15.0)
$21,000 – $50,999	51 (38.1)
$51,000 – $80,999	18 (13.4)
$81,000 or more	29 (21.6)
Not stated	16 (11.9)
Birthplace	
Canada	99 (73.9)
Europe	20 (14.9)
Asia	4 (3.0)
United States	3 (2.2)
Other	8 (6.0)

Ethnic Background[a]	11 (8.2)
Canadian	4 (3.0)
Aboriginal/First Nations	58 (43.3)
English/Irish/Scottish	26 (19.4)
German/Italian/French	21 (15.7)
European	6 (4.5)
Chinese/Asian	2 (1.5)
East Indian	1 (0.7)
American	6 (4.5)
Other (includes non-racial or non-regional definitions)	34 (25.4)
Not stated	

[a]More than one response permitted; total exceeds 100%.

Cardiac History

This study specifically examined the perceptions and behaviours of individuals relative to their diagnosis of CAD. Of particular interest is whether there were differences between responses based on the timing of the initial CAD diagnosis and data collection. It is important to acknowledge that, in this study, variables pertaining to the year of diagnosis and times admitted to hospital for CAD are self-reported data. Despite every attempt to confirm these variables with objective data, the relevant information often was not available in the patients' medical charts. Any variable requiring recall information pertaining to a significant event, such as these, is subject to distortion especially when the event occurred in the distant past.[2]

Specific variables relevant to respondents' cardiac disease profile are described in Table 6. Survival and mortality scores using clinical variables were used to provide "objective" estimates of disease severity. The average 5-year survival was estimated at 81.0% (SD = 20.8%, range = 5.0% - 98.5%); the average 1-year mortality was estimated at 5.1% (SD = 6.4%, range = 1.0% - 40.0%). We expected the estimates for 5-year survival and 1-year mortality to be similar; that is, low-risk patients should score relatively high for 5-year survival and low for 1-year mortality. Conversely, high-risk patients should score relatively low for 5-year survival and high for 1-year mortality. For lower risk patients, the results of the scores were as expected; however, for the higher risk patients, the 1-year mortality scores were inconsistent. This difference can be explained by the inclusion of specific clinical variables (ejection fraction and coronary artery disease index) in the 5-year survival score resulting in a more sensitive measure of prognostic outcome compared with the 1-year mortality score.

Table 6

Cardiac Disease History of PTCA Patients

Characteristic	Frequency (%) N = 134
Year first diagnosed with CAD	
1999	63 (47.0)
1998	15 (11.2)
1990-1997	26 (19.4)
1980-1989	23 (17.2)
before 1980	7 (5.2)
Cardiac history[§]	
Angina[a]	101 (83.5)
Myocardial infarction[a]	73 (60.3)
At least one episode of heart failure[b]	14 (23.0)
Mitral regurgitation present[c]	13 (29.5)
Pre-PTCA pattern of angina	
Asymptomatic/stable angina	39 (29.1)
Progressive/unstable angina	80 (59.7)
Symptomatic post MI	15 (11.2)
Cardiac procedures in the past	
1 or more prior PTCA	20 (14.9)
1 or more prior CABG	17 (12.8)
Prior PTCA <u>and</u> CABG in past	8 (6.0)
Other cardiac procedures in past[d]	4 (3.0)
Previous admissions to hospital for CAD (minimum 1-night stay)	
Never	61 (45.5)
1-2	36 (26.9)
3-4	21 (15.7)
> 4	16 (11.9)

[2] This type of memory error is often referred to as a compression-of-time error or telescoping (Bradburn, 1983).

Specific Activity Scale	78 (58.2)
Class I	30 (22.4)
Class II	23 (17.2)
Class III	3 (2.2)
Class IV	
Total number of lesions dilated this PTCA procedure	
1	69 (51.5)
2-3	54 (40.3)
4-6	11 (8.2)
Other medical history[e]	
PVD/claudication/embolic event	12 (9.0)
TIA/CVA	9 (6.7)
Asthma/COPD	19 (14.2)
Diabetes	28 (20.9)
Malignancy	6 (4.5)
Renal insufficiency	9 (6.7)
Atrial fibrillation	5 (3.7)
Hypothyroidism	11 (8.2)
Psychiatric diagnosis (bi-polar disorder, depression)	9 (6.7)
Self-appraised heart disease severity[f]	
0-1	14 (10.4)
2 – 4	34 (25.4)
5	22 (16.4)
6 – 8	36 (26.9)
9 – 10	19 (13.1)
Not stated	9 (6.7)

[§]Includes multiple diagnoses; total exceeds 100%. [a]Information not available on all patients, n = 121; [b]n = 61; [c]n = 44. [d]Procedures include: implantation of Automatic Internal Cardioverter/Defibrillator and permanent pacemaker, surgical repair of congenital defect, and heart transplantation. [e]Although the total group is used as the denominator for these data, information was not available on all patients therefore prevalence of these variables within the study population is likely underestimated. [f]Respondents were asked to rate the severity of their heart disease on a scale from 0 (not at all severe) to 10 (very severe).

Risk Factors

Do patients understand the detrimental effects of multiple risk factors as well as the usefulness of risk factor reduction as an intervention for cardiac disease? Within our population, 94.8% of patients recognised that multiple risk factors increased CHD risk; 5.2% were either unsure or did not think there would be increased risk with multiple risk factors. When asked to estimate the effect on risk, 70.1% were aware that multiple risk factors would increase their risk "a lot," whereas 8.7% stated that risk would be increased by "a little," and 21.3% did not know the extent to which multiple risk factors would increase cardiovascular disease risk.

The most frequently reported risk factor for heart disease was "too much fat in the diet" (71.6%).[3] The risk factors least frequently mentioned were hypertension and diabetes (3.7% and 7.5%, respectively). Remarkably, not a single patient within the study sample was able to recall completely the conventional cardiovascular risk factors of smoking, diabetes, high blood pressure, high cholesterol and positive family history. Further, to determine more accurately the prevalence of cardiovascular risk factors within the sample, patients were asked whether they had or did not have a specific cardiovascular risk factor (positive family history, elevated cholesterol or blood pressure, smoking or diabetes). Table 7 includes the prevalence of reported risk factors. Other variables relating to the risk factor profile of the study sample include body mass index, exercise patterns, estimation of dietary fat and cholesterol intake, and depression (see Table 8).

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[3] It is unclear if "too much fat in the diet" referred to diet alone, or if this also encompassed increased blood cholesterol levels as a result of dietary fat. Other studies have used one category to describe diet and elevated

Table 7

Cardiovascular Risk Factor Information

Variable of Interest	**Frequency (%)[§] (mentioned by patient) N = 134**
In general, the reported causes of heart disease	
Heredity	54 (40.3)
Smoking	70 (52.2)
High cholesterol	57 (42.5)
Too much fat in diet	96 (71.6)
High blood pressure	5 (3.7)
Diabetes	10 (7.5)
Stress	44 (32.8)
Obesity	18 (13.4)
Sedentary lifestyle	60 (44.8)
Alcohol consumption	22 (16.4)
What has contributed to their heart disease	
Heredity	55 (41.0)
Smoking	37 (27.6)
High cholesterol	38 (28.4)
Too much fat in diet	64 (47.8)
High blood pressure	4 (3.0)
Diabetes	15 (11.2)
Stress	37 (27.6)
Obesity	8 (6.0)
Sedentary lifestyle	18 (13.4)
Alcohol consumption	8 (6.0)
Prevalence of risk factors reported by patients	
Any family history of heart disease or stroke[a]	99 (73.9)
True positive family history[b]	9 (6.7)
Elevated cholesterol	87 (64.9)
Hypertension	69 (51.5)
Diabetes	36 (26.9)
Smoking	
Smoked cigarettes in last 5 years	31 (23.1)
Current smoker	8 (25.8)

[§]Multiple responses permitted; totals exceed 100%. [a]Question asked "Do you have a family history of heart disease or stroke?" [b]Variable derived from clinical definition of positive family history: First degree relative with evidence of CAD or stroke age 55 or less (male) or age 65 or less (female).

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cholesterol because patients often link diet and elevated cholesterol referring to them synonymously as "diet" (Zerwic et al., 1997).

Table 8

Lifestyle / Depression Characteristics

Characteristic	Frequency (%) N=134
BMI (kg/m^2)[a]	
19.7 – 24.9 (Desirable)	32 (24.1)
25.0 - 29.9 (Grade 1 obesity)	70 (52.6)
30.0 – 40.0 (Grade 2 obesity)	30 (22.6)
> 40 (Grade 3 [morbid] obesity)	1 (0.8)
Exercise patterns	
Daily	34 (25.4)
5-6 x per week	14 (10.4)
2-4 x per week	18 (13.4)
1-2 x per week	12 (9.0)
Less than 1 x per week	9 (6.7)
Never	47 (35.1)
Dietary fat and cholesterol intake	
Moderate to low (NWLRC score ≤ 24)	54 (40.3)
High (NWLRC score > 24)	80 (59.7)
Depressed (GDS score ≥ 5)	29 (21.6)

[a]n = 133; Obesity defined according to American College of Sports Medicine (1995).

The data were also examined to determine whether respondents who had diabetes, hypertension, dyslipidemia, or obesity identified these conditions as personal risk factors contributing to their cardiovascular disease. Of the respondents with diabetes, only 41.7% mentioned diabetes as a personal risk factor; of those with hypertension, only 5.8% mentioned high blood pressure as a personal risk factor. Of the respondents who were identified as having elevated blood cholesterol, 58.6% identified "too much fat in diet" and 39.1% identified "high cholesterol" as personal risk factors. Only 6.9% of respondents who had a BMI > 25kg/m^2 mentioned obesity as a risk factor contributing to their heart disease.

For each recognised cardiovascular risk factor noted in a review of the respondent's medical record (family history, smoking, dyslipidemia, diabetes, hypertension) three options were available: yes, this is a risk factor for this patient; no, this is not a risk factor for this patient; or not mentioned meaning no reference to this risk factor could be found anywhere in the patient's chart. Other risk factors, as defined by the physician, were also included (such as stress, sedentary lifestyle, and obesity). These data are shown in Table 9.

Table 9

Prevalence of Risk Factors Reported in Medical Records

	Frequency (%)		
Risk factor	**Yes**	**No**	**Not mentioned**
Positive family history	39 (29.1)	18 (13.4)	77 (57.5)
Dyslipidemia	61 (45.5)	19 (14.2)	54 (40.3)
Hypertension	53 (39.6)	38 (28.4)	43 (32.1)
Diabetes	30 (22.4)	52 (38.8)	52 (38.8)
Smoking	21 (15.7)	73 (54.5)	40 (29.9)
Sedentary lifestyle	6 (4.5)	19 (14.2)	109 (81.3)
Obesity	18 (13.4)	3 (2.2)	113 (84.3)
Stress	1 (0.7)	1 (0.7)	132 (98.5)

Discrepancies between risk factor prevalence reported by the patients and reported in their medical record were noted. The variable of "family history" had the greatest discrepancy, and this may be attributed to several reasons: (a) despite its importance as a risk factor, family history is very difficult to quantify or accurately assess, even in large studies such as the Framingham Heart Study (Anderson, Wilson, Odell, & Kannel, 1991); (b) the patients' reports of any family history of heart disease or stroke are grossly overestimated because of their inclusion of all relatives at all ages; (c) the derived variable "true positive family history" is likely underestimated because of the limitations associated with recall information; (d) the actual definition used for “positive family history” in the medical record is rarely defined (while it is assumed that when mentioned in the medical history “positive family history” would meet the criteria of first-degree relative, male 55 years or less, female 65 years or less, the actual definition or definitions used were never stated).

The risk factors of dyslipidemia, hypertension, and diabetes are under-reported in the medical record when compared to what the patients reported when asked specifically if they had these same risk factors. Although it appears that the medical chart review overestimated the number of smokers, it is likely that this reflects the combining of current smokers (n = 8; 6.0%) with recent "quitters" (those who stopped smoking in 1999: n = 12; 9.0%). The point at which smoking ceases to be a cardiovascular risk factor for former smokers is debatable because the accumulated risk from years of smoking does not disappear at the time of smoking cessation. Some experts suggest that smoking should count as a risk factor for former smokers for up to 10 years after cessation, or longer depending on the amount smoked in the past (Hammond, 1966; Taylor, Oudit, Kalman, & Liu, 1998). Moreover, passive exposure to cigarette smoke has also emerged as a risk factor for cardiovascular disease (Glantz & Parmley, 1991; Werner & Pearson, 1998). When these are taken into account, the prevalence of smoking as a risk factor in this study is likely underestimated.

Sedentary lifestyle, obesity and stress were significantly under-reported in the medical record. While it is acknowledged that these factors are not recognised as independent risk factors for cardiovascular disease, they can adversely affect other cardiovascular risk factors and consequentially, cardiovascular disease outcomes.

Anticipated PTCA Outcomes

In order to better understand how the respondents in the study perceived their PTCA procedure, several questions were asked regarding procedural outcomes and the likelihood of requiring another PTCA in the future. These results are presented in Table 10. The majority of respondents stated they would have improvement in some aspect of their life, for example, having fewer symptoms, living a longer life, being able to do more activities, or having less chance of an MI in the future. The respondents varied in reporting the technical aspects of the procedure, with the respondents who had a stent implanted relaying this technical aspect of the procedure most frequently. Of the 116 respondents that had at least one stent implanted during their PTCA, more than one half (53.8%) stated that they had a stent after the procedure. When examining the responses for the variables requiring respondents to estimate their chance for requiring PTCA sometime in the future, a multi-modal distribution appeared (see Figure 2). This type of distribution may suggest digit preference rather than a precise estimation of perceived need for future PTCA.

Figure 2

Chance of Ever Needing PTCA in Future

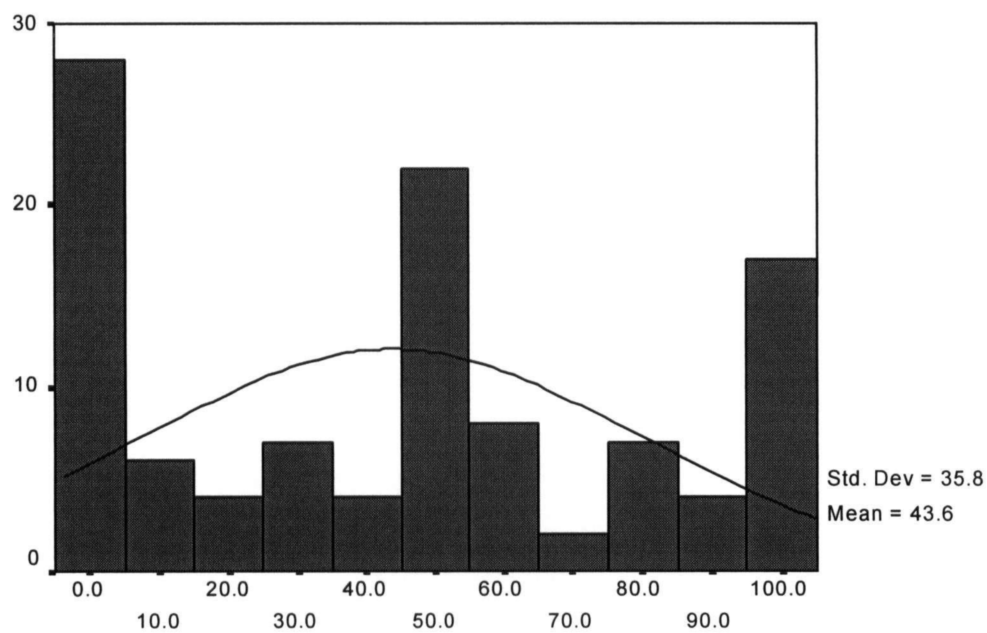

Table 10

Perception and Anticipated Outcomes Related to PTCA Procedure

Characteristic	Frequency (%)[§]
Mechanism of PTCA procedure	
Balloon pushed blockage out of the way	18 (13.4)
Balloon pressed and flattened blockage	12 (9.0)
Stent holding artery open	63 (47.0)
Opened up artery "somehow"	36 (26.9)
Not stated	5 (3.7)
Anticipated PTCA outcomes[a]	
Will have fewer symptoms	126 (94.0)
Will live a longer life	119 (88.8)
Will be able to do more activities	114 (85.1)
Less chance of having MI in the future	109 (81.3)
Other anticipated PTCA outcomes[b]	
Increased energy and/or activity levels	43 (32.1)
Alleviated fears, worry, pain	11 (8.2)
Increased confidence, happiness and/or sex life	29 (21.6)
Increased awareness about needed lifestyle change	22 (16.4)
No other beneficial outcomes	55 (41.0)
May contribute to acceleration of CAD/temporary benefit only	2 (1.5)
Patients recall of what MD told them at post-PTCA bedside visit[c]	
"Excellent results"	4 (4.1)
Implied procedure was successful	59 (60.8)
Implied procedure only partially successful	1 (1.0)
Technical information provided ("He put a balloon in my artery")	19 (19.6)
Unable to recall	14 (14.4)
Chance of needing another angioplasty in the next year	
0%	67 (50.0)
1% – 10%	17 (12.7)
11% – 50%	27 (20.1)
51% – 100%	10 (7.5)
Not stated	13 (9.7)
Chance of needing another angioplasty in the next 5 years	
0%	43 (32.1)
1% – 49%	28 (20.9)
50%	21 (15.7)
51% – 99%	14 (10.4)
100%	7 (5.2)
Not stated	21 (15.7)

Chance of needing another angioplasty ever again in the future	
0%	27 (20.1)
1% – 49%	23 (17.1)
50%	21 (15.7)
51%-99%	22 (16.4)
100%	16 (11.9)
Do not know	25 (18.7)

[§]Multiple responses permitted; totals exceed 100%.
[a]Predetermined categories – patients asked to respond "yes" or "no." [b]Patient-defined categories. [c]n = 97.

Presence/Absence of Healthful Lifestyles

Respondents were asked questions related to the presence or absence of healthful lifestyle behaviours. As discussed in Chapter 3, both direct and indirect questions were asked in a variety of ways to elicit the information. Tables 11 – 14 summarise the data related to dietary factors, BMI, exercise patterns, and smoking patterns. Table 11 displays the responses pertaining to high fat/high cholesterol diet as a risk factor for cardiovascular disease. To illustrate the discrepancy between reported dietary habits and actual dietary habits as measured by the NWLRC, the data are presented for all respondents, as well as just the respondents who adhered to a high fat/high cholesterol diet. Table 12 represents the appraisal of body weight and weight loss efforts stratified according to BMI. Respondents with Grade 1 to 3 obesity for the most part acknowledged they were overweight (ranging from "slightly" to "very" overweight), however there was a noteworthy lack of recognition for obesity as either a general or personal risk factor for cardiovascular disease. Table 13 displays the reported exercise frequency and the distribution of responses. The majority of the respondents stated that they "never" exercised, and despite some recognition of sedentary lifestyle as a general risk factor for cardiovascular disease, sedentary lifestyle as a personal risk factor was vastly underreported. Table 14 presents an overview of the patterns of cigarette smoking of the respondents. The majority of the respondents were nonsmokers in the last 5 years or had never smoked. The current smokers and the smokers who stopped sometime in the preceding months of 1999 appeared to have an accurate appreciation for the increased personal risk for cardiovascular disease associated with smoking.

Table 11

Dietary Risk Factors and Purported Dietary Modification to Reduce CHD Risk by Respondents Adhering to High Fat/Cholesterol Diet

Variable	All Respondents Frequency (%) (N = 134)	Respondents Adhering to High Fat/Cholesterol Diet Frequency (%) (n = 80)[§]
Dietary fat recognised as a general risk factor for CHD	96 (71.6)	56 (70.0)
Dietary fat recognised as a personal risk factor for CHD	64 (47.8)	36 (45.0)
Dietary cholesterol acknowledged as a general risk factor for CHD	57 (42.5)	32 (40.0)
Dietary cholesterol acknowledged as a personal risk factor for CHD	38 (28.4)	23 (28.8)
Of all personal CHD risk factors, poor diet identified as most significant	29 (21.6)	15 (18.8)
Changed diet to reduce CHD risk	82 (61.2)	44 (55.0)
Managed dyslipidemia by		
Reduced intake of dietary fat	70 (60.9)[a]	35 (53.0)[b]
Reduced intake of dietary cholesterol	59 (51.3)[a]	31 (47.0)[b]
Used diet as strategy to manage diabetes	27 (75.0)[c]	17 (77.3)[d]

[§]Total number of respondents who scored > 24 NWLRC score. [a]n = 115; total number of respondents who stated they had elevated blood cholesterol levels. [b]n = 66; total number of respondents who stated they had elevated blood cholesterol levels and had NWLRC score > 24. [c]n = 36; total number of respondents who stated they had diabetes. [d]n = 22; total number of respondents who stated they had diabetes and had NWLRC score > 24.

Table 12

Self-Appraised Weight/Weight Loss Efforts

According to Body Mass Index[a]

	Body Mass Index Category/Obesity Grade			
	Desirable (19.7 – 24.9) $\underline{n} = 32$ frequency (%)[c]	**Grade 1 (25.0 – 29.9)** $\underline{n} = 70$ frequency (%)[c]	**Grade 2 (30.0 – 40.0)** $\underline{n} = 30$ frequency (%)[c]	**Grade 3 (> 40.0)** $\underline{n} = 1$ frequency (%)[c]
Identified self as…[b]				
Underweight	7 (21.9)	1 (1.4)	-	-
"Just about right"	20 (62.5)	19 (27.1)	-	-
Slightly overweight	5 (15.6)	24 (34.3)	7 (23.3)	-
Somewhat overweight	-	20 (28.6)	10 (33.3)	-
Very overweight	-	6 (8.6)	13 (43.3)	1 (100.0)
Trying to lose weight	9 (28.1)	45 (65.7)	24 (80.0)	1 (100.0)
Obesity acknowledged as a general risk factor for CHD	5 (15.6)	7 (10.0)	6 (20.0)	0
Obesity acknowledged as a personal risk factor for CHD	1 (3.1)	2 (2.9)	5 (16.7)	0
Of all personal CHD risk factors, obesity identified as most significant	-	-	2 (6.7)	-
Lost weight to reduce CHD risk	-	4 (5.7)	1 (3.3)	1 (100.0)

[a]Body Mass Index = kg/m^2; [b]$\underline{N} = 133$. [c]Denominator used to calculate frequency percent is total number in each BMI category.

Table 13

Reported Implementation of Exercise as a Risk Reduction Strategy vs. Actual Exercise Pattern

	Reported Exercise Frequency: Times Per Week Engages in Exercise				
	Daily	**5 - 6**	**3 – 4**	**1 – 2 or less**	**Never**
Distribution of responses according to exercise frequency (N = 134)	**34 (25.4)**	**14 (10.4)**	**18 (13.4)**	**21 (15.7)**	**47 (35.1)**
Sedentary lifestyle acknowledged as a general risk factor for CHD[a]	16 (47.1)	5 (35.7)	11 (61.1)	13 (61.9)	15 (31.9)
Sedentary lifestyle acknowledged as a personal risk factor for CHD[a]	1 (2.9)	3 (21.4)	-	6 (28.6)	8 (17.0)
Of all personal CHD risk factors, sedentary lifestyle identified as most significant[a]	-	1 (7.1)	1 (5.6)	2 (9.5)	4 (8.5)
Current amount of exercise is....[a]					
As much as needed	21 (61.8)	5 (35.7)	9 (50.0)	3 (14.3)	7 (14.9)
Less than needed	12 (35.3)	8 (57.1)	8 (44.4)	18 (85.7)	33 (70.2)
Do not know	1 (2.9)	1 (7.1)	1 (5.6)	-	7 (14.9)
States exercise program implemented to reduce CHD risk[a]	15 (44.1)	7 (50.0)	10 (55.6)	8 (38.1)	15 (31.9)

[a]Denominator used to calculate frequency percent is total number in each exercise frequency category.

Table 14

Cigarette Smoking as a CHD Risk Factor:

Profile of Current Smokers vs. Non-Smokers

	Current Smoker	Stopped smoking 1999	Stopped smoking 1994 – 1998	No smoking in last 5 years or never smoked
Distribution of responses according to smoking history (N = 134)	**8 (6.0)**	**12 (9.0)**	**10 (7.5)**	**104 (77.6)**
Current smoker planning to stop				
Yes	4 (50.0)	N/A	N/A	N/A
No	1 (12.5)	N/A	N/A	N/A
Do not know	3 (37.5)	N/A	N/A	N/A
Smoking acknowledged as a general risk factor for CHD	6 (75.0)	7 (58.3)	8 (80.0)	48 (46.2)
Smoking acknowledged as a personal risk factor for CHD	8 (100.0)	9 (75.0)	7 (70.0)	12 (11.5)
Of all personal CHD risk factors smoking identified as most significant	5 (62.5)	3 (25.0)	3 (30.0)	7 (6.7)
States stopped smoking to reduce CHD risk	N/A	8 (66.7)	6 (60.0)	8 (7.6)

Perceptions of Risk of Disease Progression and Death

Subjective Risk Perceptions

Respondents were asked to estimate their chance for cardiovascular disease progression and death in the next year, the next 5 years, and ever in the future (see Table 15) by providing estimates using a scale ranging from 0% (meaning that there was absolutely no chance) to 100% (meaning that it was an absolute certainty). When examining the distribution of responses for these variables, a multi-modal pattern emerged similar to that observed for the variable requiring an estimation of the chance for requiring PTCA sometime in the future. This type of distribution may suggest digit preference rather than a thoughtful and precise estimation of chance for cardiovascular disease progression and death.

Table 15

Perceived Chance for Cardiovascular

Disease Progression and Death

Variable	Frequency (%)
Chance for cardiovascular disease progression	
In next year (n = 125)	
0%	46 (36.8)
1 – 9 %	14 (11.2)
10%	13 (10.4)
11 – 49%	21 (16.8)
50 %	18 (14.4)
51 – 99 %	9 (7.2)
100%	4 (3.2)
In next 5 years (n = 123)	
0%	28 (22.8)
1 – 9 %	13 (10.6)
10%	12 (9.8)
11 – 49%	23 (18.7)
50 %	24 (19.5)
51 – 99 %	15 (12.2)
100%	8 6.5)
Ever in the future (n = 115)	
0%	21 (18.3)
1 – 9 %	8 (7.0)
10%	6 (5.2)
11 – 49%	22 (19.1)
50 %	19 (16.5)
51 – 99 %	19 (16.5)
100%	20 (17.4)

Chance for cardiovascular death	
In next year (n = 122)	
0%	84 (68.9)
1 – 9 %	8 (6.6)
10%	13 (10.7)
11 – 49%	6 (4.9)
50 %	7 (5.7)
51 – 99 %	4 (3.2)
100%	0 (0.0)
In next 5 years (n = 113)	
0%	54 (47.8)
1 – 9 %	11 (9.7)
10%	11 (9.7)
11 – 49%	14 (12.4)
50 %	17 (15.0)
51 – 99 %	3 (2.7)
100%	3 (2.7)
Ever in the future (n = 99)	
0%	21 (21.2)
1 – 9 %	7 (7.1)
10%	7 (7.1)
11 – 49%	16 (16.2)
50 %	16 (16.2)
51 – 99 %	5 (5.1)
100%	27 (27.3)

Accuracy of Perceived Risk of Cardiovascular Disease Progression

To ascertain the accuracy of the respondents' risk perceptions, their stated risk for cardiovascular disease progression was compared with an objective estimate of risk based on their known clinical parameters. We initially used the model described by Roitman, LaFontaine, and Drimmer (1998) (see Appendix E) to stratify respondents according to low, moderate and high risk for progression of atherosclerosis. A limitation of this model, however, is that it does not provide specific direction on how to categorise patients when there is overlap between categories. For example, if a patient meets all of the criteria for "low risk" except for a single criterion, it is not clear which category the patient should be assigned. The primary author of the model, Dr. Roitman, was contacted to provide further direction. In his response, Dr. Roitman suggested that patients should be managed according to individual risk factors and that there was no "overall score" or weighting scheme with this model to assign patients to a single category (Dr. J. L. Roitman, personal communication, March 3, 1999). This is in contrast with the published model which suggests that there is a gradient of risk based on the presence or absence of specific risk factors, and that patients may be categorised accordingly.

For the purpose of this study, to provide an objective comparison for perceived risk for cardiovascular disease progression, we categorised the respondents into discrete categories. Individuals were classified as "low risk" if they met all of the defining criteria specified in Roitman et al.'s (1998) model, "high risk" if they met one of the defining criteria, and "moderate risk" by default if they were neither "high risk" nor "low risk." The defining criteria to be classified as "low risk" for progression of atherosclerosis required that the respondent: (a) be a non-smoker or had stopped smoking before 1999; (b) be given a NWLRC score ≤ 24; (c) be non – diabetic; (d) have an estimated BMI < 25 kg/m^2; (e) be non – hypertensive; (f) be not clinically depressed (Geriatric Depression Score ≤ 4); and (g) have exercise expenditure ≥ 2200 kcal/week if male or ≥ 1900 kcal/week if female.[4] The defining criterion for "high risk" for progression of atherosclerosis included one of the following: (a) current smoking; (b) NWLRC score >24; (c) diagnosis of diabetes; (d) BMI ≥ 30; (e) diagnosis of hypertension; (f) significant clinical depression (GDS ≥ 8);[5] or (g) exercise expenditure ≤ 1036 kcal/week if male or ≤ 924 kcal/week if female.

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[4]Based on the high functional capacity of the study population (82.8% of respondents were at Functional Class I – II) it is likely they engaged in a minimal amount of activity despite no organised exercise regimen. To reflect this, respondents who stated that they "never exercised" were allocated an approximate weekly caloric expenditure based on 10 minutes of low-intensity (i.e., 2.5 METS) activity four times each day. Recent research acknowledges the benefits of cumulative, low–intensity exercise efforts (Centers for Disease Control and Prevention, 1999; Health Canada, 1998).

[5] The GDS cutpoint for moderate depression is ≥ 8 points (Almeida & Almeida, 1999).

Using this stratification scheme, 88.8% (n = 119) of the respondents were identified as being at "high risk" for the progression of atherosclerosis; no respondents were identified to be at "low risk", and 11.2% (n = 15) were identified to be at "moderate risk." The limited range of risk, with the majority of the respondents being classified at "high risk" rendered the model to be of no use for the purpose of assessing the accuracy of the respondents' subjective risk perceptions for cardiovascular disease progression. Using this risk stratification model would greatly overestimate the optimistic bias of the respondents. Because of the lack of other risk stratification models in the literature to objectively estimate risk for cardiovascular disease progression, we were unable to assess the accuracy of the risk perceptions for cardiovascular disease progression.

Accuracy of Perceived Risk of Cardiovascular Death

Inter-correlations were computed for the variables indicating respondents' perceived chance for requiring future PTCA, their chance for CHD progression, their chance for death from cardiovascular disease, as well as their perceived severity of disease and the estimated 5-year survival (the correlation matrix is displayed in Table 16).

Table 16

Intercorrelations Among Respondents' Subjective Risk Assessments of Disease Severity, Progression and Death and an Objective Estimated Five-Year Survival Score

	1	2	3	4	5	6	7	8	9	10	11
1. Need future PTCA in next year	--										
2. Need future PTCA in next 5 years	.75**	--									
3. Need future PTCA ever	.53**	.78**	--								
4. CHD progression in next year	.51**	.53**	.35**	--							
5. CHD progression in next 5 years	.47**	.55**	.45**	.80**	--						
6. CHD progression ever	.44**	.55**	.55**	.61**	.81**	--					
7. CHD death in next year	.38**	.34**	.24*	.27**	.35**	.21*	--				
8. CHD death in next 5 years	.27**	.37**	.32**	.33**	.44**	.37**	.67**	--			
9. CHD death ever	.22*	.36**	.48**	.40**	.52**	.60**	.33**	.53**	--		
10. Severity of CHD	.13	.18	.13	.25**	.23*	.11	.05	.18	.20	--	
11. Estimated 5-year survival	-.06	-.07	.04	-.04	-.08	-.13	-.22*	-.37**	-.17	-.10	--

**Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed).

Significant correlations were found among all the variables pertaining to subjective perceptions of chance of requiring future PTCA, chance of progression of CHD, and chance of cardiovascular death (range of $r = .21 - .81$). The strongest correlations were found when comparing related variables. For example, moderate to high correlations were found between perceived chance of needing future PTCA in one year's time and chance of needing future PTCA in the next five years ($r = .75$) or ever ($r = .53$). The perceived chance of CHD progression in the next year was also strongly correlated with the chance for CHD progression in the next five years ($r = .80$) and the chance for CHD progression, ever ($r = .61$). The correlations for perceived chance for CHD death in the next year, next 5 years, or ever were also significantly correlated ($r = .67$ and .33, respectively), although the strength of the correlation was in the moderate range. The patterns of the correlations suggest relative consistency in the respondents' answers with diminishing consistency occurring as the time frames lengthen.

The subjective perception of severity of heart disease (scored with possible range 0 – 10) was moderately correlated with perceived chance of CHD progression in the next year ($r = .25$) and perceived chance of CHD progression in the next 5 years ($r = .23$); but no statistically significant correlation was found between perceived severity of heart disease and perceived chance for CHD progression ever in the future, need for PTCA, and perceived chance of CHD death in next year, five years, or ever.

The "objectively" estimated 5–year survival score was only correlated with the respondents' subjective perception of chance for CHD death in the next 5 years ($r = -.37$) and, albeit less strongly, with their subjective perception of chance for CHD death in the next year ($r = -.22$). The objective score (estimated 5-year survival) was not correlated with the respondents' perceptions of their need for PTCA or their chance of CHD progression, during the three relevant time frames, or their perceived severity of disease.

The estimated 5-year survival score and the respondents' perception of chance for CHD death in the next 5 years were used to determine the accuracy of the subjective perceptions relating to chance for cardiovascular death. First, the time frames for these variables are equivalent and the outcomes are the same. Second, using the estimated 5-year survival score and the respondents' subjective estimate of chance of CHD death in the next 5 years offers a conservative evaluation of accuracy because this pair of variables had the highest correlation. A more liberal approach using any other combination of variables would generate a greater number of respondents being defined as overly optimistic or pessimistic.

Estimating an Accuracy Score for Perceived Chance of CHD Death

Each respondent's score for 5-year survival was converted to an inverse score yielding an objective estimate of 5-year mortality (1 – nomogram score x 100). The subjective risk perception of CHD death in the next five years was subtracted from the objective estimate, resulting in a net accuracy score. Table 17 explains the cutpoints for level of accuracy; Table 18 displays the accuracy results for the study. Those respondents who reported their chance of CHD death to be more than 10% higher than their estimated 5-year mortality score were classified as pessimists (negative scores). Conversely, those who reported their chance of CHD death to be less than 10% lower than their estimated 5-year mortality score were classified as optimists (positive scores). All others estimating their risk between ±10% of their objective estimate of 5-year mortality were classified as accurate judges of their risk.

Table 17

Cutpoints for Accuracy Determination

Level of Accuracy	(Objective Estimate) – (Subjective Estimate) =
Accurate	**–10% - +10% (range)**
Optimist	**> 10%**
Pessimist	**< - 10%**

Table 18

Accuracy of Subjective Estimation for Chance of CHD Death in Next Five Years

Level of Accuracy	Frequency (%) N = 113[§]
Accurate	50 (44.3)
Optimist	37 (32.7)
Pessimist	26 (23.0)

[§]Respondents who answered "do not know" (n = 21) when asked to estimate their chance for dying from cardiovascular disease in the next 5 years were not included in these analyses.

Determinants and Behavioural Outcomes Related to Level of Accuracy

Understanding the determinants of accurate, optimistic and pessimistic risk perceptions may be important in understanding why individuals adopt or do not adopt healthful lifestyle behaviours to reduce cardiovascular risk. Bivariate and multivariate analyses were conducted in an attempt to determine what factors contributed to the level of accuracy for the respondents' subjective estimation of chance of CHD death. Chi-square analysis was used for the demographic variables of gender, marital status, educational attainment, income, presence or absence of depression, and birthplace. No differences were found between the groups using these categorical demographic variables (see Table 19). Step-wise discriminant function analysis was conducted using these six demographic variables as predictors of membership in each accuracy group; this analysis confirmed that there were no associations between these variables and level of accuracy.

Age was treated as a continuous variable and ANOVA indicated that it was associated with level of accuracy. On average, those with accurate perceptions of their risk were 59.7 years of age (SD = 11.0), pessimists were 62.7 years of age (SD = 10.3), and optimists were 66.2 years of age (SD = 8.9) (F = 4.33; p = .02). Post hoc analysis revealed that those who were accurate in their risk perception were statistically significantly younger than the optimists.

Table 19

Association Between Demographic Variables and Accuracy of Risk Perception

Variable	Pessimist (n = 26)	Accurate (n = 51)	Optimist (n = 36)	χ^2 (d*f*)
Gender				**4.03 (2)**
Male	17 (19.1%)	41 (46.1%)	31 (34.8%)	
Female	9 (37.5%)	10 (41.7%)	5 (20.8%)	
Marital Status				**1.41 (2)**
Partnered	8 (28.6%)	10 (35.7%)	10 (35.7%)	
Not Partnered	18 (21.2%)	41 (48.2%)	26 (30.6%)	
Education				**0.79 (2)**
High School graduate or less	7 (21.2%)	17 (51.5%)	9 (27.3%)	
More than High School	19 (23.8%)	34 (42.5%)	27 (33.8%)	
Income[b]				**1.79 (2)**
Mean Rank	47.79	56.72	50.05	
Depression				**0.40 (2)**
Not Depressed (GDS score ≤ 4)	20 (22.0%)	41 (45.1%)	30 (33.0%)	
Depressed (GDS score > 4)	6 (27.3%)	10 (45.5%)	6 (27.3%)	
Birthplace				**0.96 (2)**
North America	19 (21.3%)	40 (44.9%)	30(33.7%)	
Europe, Asia, or other	7 (29.2%)	11 (45.8%)	6 (25.0%)	

[a] d*f* = 2. [b]Kruskal Wallis Test; grouping variable = level of accuracy.

Statistical analyses were conducted to determine what bearing, if any, selected clinical variables had on level of accuracy (pessimist, accurate, or optimist). The number of previous cardiac procedures, the number of previous admissions to hospital for cardiac related concerns, estimated functional class of angina as determined by the SAS, positive family history, and total number of lesions were the clinical variables used (see Table 20). Other clinical parameters already included in the objective estimation of 5-year survival were not used for these analyses.

Table 20

Clinical Determinants of Accuracy

Variable	**Pessimist (n = 26)**	**Accurate (n = 51)**	**Optimist (n = 36)**	χ^2 **(d*f*)**
Previous cardiac procedures				**5.38 (2)**
None	12 (17.1%)	37 (52.9%)	21 (30.0%)	
One or more	14 (32.6%)	14 (32.6%)	15 (34.9%)	
Previous admissions to hospital[a]				**4.71 (4)**
None	8 (15.4%)	28 (53.8%)	16 30.8%)	
1-2	7 (25.0%)	11 (39.3%)	10 (35.7%)	
3+	11 (33.3%)	12 (36.4%)	10 (30.3%)	
Estimated functional class				**2.61 (4)**
Class I	14 (19.7%)	31 (43.7%)	26 (36.6%)	
Class II	6 (27.3%)	10 (45.5%)	6 (27.3%)	
Class III - IV	6 (30.0%)	10 (50.0%)	4 (20.0%)	
Positive family history[b]				**4.18 (2)**
Yes	24 (27.9%)	37 (43.0%)	25 (29.1%)	
No	2 (8.3%)	12 (50.0%)	10 (41.7%)	
Total number of lesions[c]				
Mean Rank	58.04	51.87	63.51	**3.22 (2)**

[a] At least one-night stay in hospital for cardiac related admission. [b]Family history identified by respondent. [c]Kruskal Wallis Test; grouping variable = level of accuracy.

One-way analysis of variance was used to determine if the pessimist, accurate and optimist group means for duration of CAD diagnosis differed from one another. For this analysis, the independent variable was the level of accuracy, and the dependent variable was the duration of CAD diagnosis (see Table 21). The assumption of homogeneity of variance was not met; the pessimist group (n = 26) had a significantly longer duration of diagnosis (M = 9.2 years, SD = 10.5) than the optimistic group (n = 51) (M = 6.1 years, SD = 7.5) and the accurate group (n = 36) (M = 2.7 years, SD = 7.6). Post hoc analysis was conducted to determine which pairs of groups were significantly different from one another. Using Games-Howell post hoc analysis (because of the lack of homogeneity between the groups) significant differences were found between the pessimist and accurate groups ($p = 0.01$) and between the accurate and optimist groups ($p < 0.05$). No significant differences were found between the optimist and pessimist groups.

Table 21

Level of Accuracy and Duration of CAD Diagnosis[a]

	Sum of Squares	df	Mean Square	F	Significance
Between Groups	**752.475**	**2**	**376.238**	**7.417**	**0.001**

[a] Levene Statistic 12.56, sig. = .000 therefore homogeneity of variance not assumed.

A multinomial logistic regression was conducted to assess the relationship between age and duration of CAD diagnosis and level of accuracy. No interaction effect was found for age and duration of CAD and both variables were found to be uniquely associated with level of accuracy (see Table 22).

Table 22

Level of Accuracy, Age, and Duration of CAD Diagnosis

Level of Accuracy[a]	Covariates	B	P
Pessimist	**Age**	-.05	.06
	Duration of CAD	.06	.07
Accurate	**Age**	-.05	.03
	Duration of CAD	-.07	.08

[a]The optimists constitute the comparison group.

It is interesting to note that those with accurate perceptions of their risk are the youngest participants who had the shortest duration of diagnosis. The oldest participants were most likely to be optimists and those who had the disease for the longest duration were most likely to be pessimists.

Of further interest was what effect, if any, the accuracy of the respondents' perceptions of risk for cardiovascular death in the next five years had on the presence or absence of healthful lifestyle behaviours. Analyses were undertaken to determine if there were differences between the groups in the adoption of healthful lifestyle behaviours such as adherence to low fat/low cholesterol diet as determined by the NWLRC score, reported exercise frequency, and history of smoking in past five years (see Table 23). In relation to smoking, the overall number of current smokers (n = 8) were too few to permit detailed analyses. It is noteworthy that the one respondent (a male aged 60 years) who explicitly stated that he had no plans to stop smoking was neither optimistic nor pessimistic, but accurate in his perception for CHD death in the next five years (objective estimate of 5-year mortality was 7%).

Table 23

Presence or Absence of Healthful Behaviours by Level of Accuracy

Variable	Pessimist (n = 26)	Accurate (n = 51)	Optimist (n = 36)	χ^2 (*df*)
Dietary intake of fat and cholesterol				**2.70 (2)**
Moderate-low	12 (25.5%)	17 (36.2%)	18 (38.3%)	
High intake	14 (21.2%)	34 (51.5%)	18 (27.3%)	
Exercise				**4.90 (6)**
Daily	5 (17.2%)	11 (37.9%)	13 (44.8%)	
3-5 times each week	8 (29.6%)	13 (48.1%)	6 (22.2%)	
1-2 times each week	3 (15.0%)	10 (50.0%)	7 (19.4%)	
Never	10 (27.0%)	17 (45.9%)	10 (27.0%)	
History of smoking (past 5 years)				**4.08 (2)**
Yes	9 (31.0%)	15 (51.8%)	5 (17.2%)	
No	17 (20.2%)	36 (42.9%)	31 (36.9%)	

One-way analysis of variance was used to determine if the group mean BMI differed between the pessimist (M = 27.8 kg/m^2, SD = 4.8), accurate (M = 27.4 kg/m^2, SD = 4.4) and optimist (M = 27.5 kg/m^2, SD = 4.0) groups (see Table 24). No statistically significant differences were noted between the groups.

Table 24

Level of Accuracy and BMI[a]

	Sum of Squares	d*f*	Mean Square	F	Significance
Between Groups	**2.748**	**2**	**1.374**	**0.071**	**0.932**

[a] Levene Statistic .14, sig. = .866 therefore homogeneity of variance assumed.

Summary

The following questions were posed by this study:

1. *What is the correspondence between an individual's perceptions and objective evaluations of risk of cardiac disease progression and death?*
2. *What factors are associated with accurate, pessimistic or optimistic risk perceptions?*
3. *What is the relationship between perceptions of risk of cardiac disease progression and death and the adoption of healthful lifestyle behaviours known to be associated with reducing risk of cardiac disease?*

For Question 1, we were unable to establish a reliable objective estimate of cardiac disease progression, therefore it was no possible to identify the correspondence between the respondent's perceptions and an objective evaluation for this aspect of the question. The findings revealed that the respondents' perceptions of risk of cardiac death (in the next 5 years) were accurate for 44.3% of the population, optimistic (or underestimated) for 32.7% of the population, and pessimistic (or overestimated) for 23.0% of the population.

For Question 2, the sociodemographic factors of gender, marital status, level of education, annual household income, depression, or cultural/ethnic identity were not found to be associated with level of accuracy. Age was found to be associated with level of accuracy, those with accurate perceptions of their risk were younger than those with optimistic biases. Further, clinical factors specifically related to cardiac disease such as previous cardiac procedures or admissions to hospital, functional class (as defined by SAS), positive family history of cardiac disease, or total number of lesions dilated during the PTCA procedure were not found to be associated with level of accuracy. The only clinical factor that appeared to be associated with the level of accuracy was the duration of diagnosis with coronary artery disease. The respondents with pessimistic biases had a significantly longer duration of diagnosis than the respondents with optimistic biases or accurate perceptions of their risk of cardiovascular death in the next five years. Those with accurate perceptions of risk had the shortest duration of diagnosis of coronary artery disease.

For Question 3, because of the lack of a reliable objective estimate for cardiovascular disease progression, we were unable to answer this aspect of the question. For the relationship between perceptions of risk of cardiac death and the adoption of healthful lifestyle behaviours known to be associated with reducing risk of cardiac disease, we did not find any statistically significant associations between the level of accuracy of the risk perception of cardiac death and the adoption of healthful lifestyle behaviours known to be associated with reducing risk of cardiac disease.

CHAPTER 5: DISCUSSION

This final chapter provides a summary of some of the key findings of this study. The key findings discussed herein pertain to cardiovascular risk factor knowledge, accuracy of risk perceptions and misrepresentations. These findings were selected for discussion as they may offer useful insight for the health-care professionals working with individuals with cardiovascular disease. An overview of the limitations of this study, and a commentary regarding the implications that these findings may have for the clinical care of patients with cardiovascular disease are also included.

Cardiovascular Risk Factor Knowledge

It is thought that knowledge of cardiovascular risk factors is an important precursor to the adoption of healthful lifestyle behaviour. The respondents in this study were asked to identify cardiovascular risk factors in general and also those factors specific to their diagnosis of cardiac disease. When the respondents were asked to identify general risk factors for heart disease, the most frequently mentioned were "too much fat in the diet" (71.6%) and "smoking" (52.2%). Other risk factors were reported much less frequently, with diabetes and hypertension reported the least frequently as general risk factors for heart disease (7.5% and 3.7%, respectively). Not a single respondent identified a complete list of accepted cardiovascular risk factors (smoking, hypertension, elevated cholesterol, positive family history, and diabetes). These finding are consistent with other studies finding diet or smoking to be frequently identified as risk factors, hypertension and diabetes to be underreported, and for listings of all risks factors to be incomplete (Marteau et al., 1995; Silagy et al., 1993; Zerwic et al., 1997).

When respondents were asked to identify the risk factors that had contributed specifically to their diagnosis of heart disease, all possible risk factors were reported with less frequency than the general risk factors. When examined in relation to the respondents' diagnosed risk factors, the data demonstrate that respondents with diabetes were able to recognise diabetes as a personal risk factor with greater frequency (41.7%) than those without the condition (7.5%). Of the respondents with elevated cholesterol, 58.6% and 39.1% were able to recognise too much fat in the diet and high cholesterol, respectively, as personal risk factors which was slightly lower than the frequencies reported for the respondents without a diagnosis of elevated cholesterol. Being obese or hypertensive did not appear to offer any appreciable insights for respondents in relation to their identification of personal risk factors. For obesity, 6.9% of respondents who had a BMI in excess of $25kg/m^2$ recognised obesity as a personal risk factor (compared to 5.8% of all respondents); 5.8% of respondents with hypertension recognised hypertension as a personal risk factor (compared to 3.7% of all respondents).

The results overall reflect an inability of the respondents to identify general cardiovascular risk factors and an even greater inability to identify their personal risk factors for cardiovascular disease. Most notable, however, is the dismal rate of reporting, as personal risk factors, diabetes, dyslipidemia, hypertension and obesity by individuals who have these risk factors.

Risk factor knowledge is cultivated through many sources and exposure to information. Although the emphasis on risk factor education in the context of cardiovascular disease focuses on the interactions between patient and health-care professional, in reality, we cannot discount the influence of risk factor knowledge obtained through social or political contexts.

Why smoking and high fat diet emerge as the most recognised general risk factors may have less to do with an understanding of how these function as cardiovascular risk factors, and be more related to the prolific number of health messages that are part of the social environment (emphasis on healthier lifestyles, fitness, diets) and the political milieu (tobacco related legislation and policy). For example, much of the consumer information pertaining to dietary and obesity related issues is motivated by advertising strategies as a means to promote specific products or services. Further, advertising campaigns frequently use endorsements by high profile individuals to add a personal dimension to the advertised message. Dietary products are labelled "low-fat" or "fat-free" and are widely promoted as a preferred food choice, and weight loss is heralded as "a step in the right direction" for individuals fraught with a distressed or troubled past.[6] Consumers, exposed to these types of dietary messages from a plethora of sources, are simultaneously exposed to the implicit message that high-fat-food products and obesity may be detrimental not only to physical health but also psychological health and well being. In the United States, for example, there is evidence to support the notion that dietary messages disseminated through the mass media and screening initiatives have cultivated some dietary trends such as lower fat milk products and reduced egg consumption (Stephen & Wald, 1990; Thomas, 1991).

The detrimental effects of smoking have been promoted through political, social, and health contexts. Recent attention has emphasised the detrimental effects of passive or environmental smoke exposure. Although the mechanisms by which passive smoke exposure contribute to increased risk for cardiovascular disease are not fully understood, the relative risk for cardiovascular disease is 1.2 to 1.3 in individuals exposed to passive smoking (Kawachi et al., 1997; Steenland, Thun, Lally, & Heath, 1996). The debate about legislative control over smoking in public places and work environments is profiled in various public media. These types of media messages, although related to the political agenda of smoking policy, still expose individuals to messages about the risks associated with smoking.

Conversely, in relation to risk factors for diabetes, hypertension, and dyslipidemia, the public relies to a greater extent on health-care professionals and organisations such as the Heart

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[6] For example, consider recent campaigns for Weight Watchers™ using Sarah Ferguson, Duchess of York as a

and Stroke Foundation of Canada or the Canadian Diabetes Association to communicate health messages. When examining the scale of availability of information to the general public, consumer-driven risk information from advertising and marketing, or other media efforts, by far reach more individuals than information provided by health-care professionals or organisations. This may explain why respondents in this study identified too much fat in the diet and smoking most frequently as general cardiovascular risk factors. Some researchers suggest that these discrepancies in how individuals report risk factors may represent a cognitive weighting of risk factors in which "visible" risk factors such as smoking are given more credence than "hidden" risk factors like hypertension or elevated cholesterol (Marteau et al., 1995).

More complex, however, is attempting to explain why respondents were less able to identify personal risk factors relative to their own diagnosis of heart disease. The intrinsic processes by which an individual constructs and identifies personal risk factors are poorly understood. It is generally accepted that the information received from health-care professionals influences knowledge about risk factors. How effectively the risk information is communicated may influence how well the messages are received. For example, Covello (1995) suggests that trust and credibility are essential when health-care professionals deliver risk messages. This trust and credibility is built over time and only is cultivated when the recipient of the risk information perceives (a) caring and empathy, (b) competence and expertise, (c) honesty and openness, and (d) dedication and commitment. Because of the expenses involved in modern healthcare systems, interactions with health-care professionals may be defined out of fiscal necessity to be brief, problem-based encounters (Winefield, Murrell, & Clifford, 1995). Brief, infrequent encounters may limit opportunities to foster the essential components of trust and credibility, and physicians and other health-care professionals may be less inclined to invest time and energy in

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spokesperson and Jenny Craig™ using Monica Lewinsky as a spokesperson.

single or short-term interactions (Covello, 1995). Further, when patients are exposed to various health-care providers or programs, there may be assumptions made that the jurisdiction for providing specific information belongs to another physician or health care professional (Akre, Falkum, Hoftvedt, & Aasland, 1997). In the present study, many patients were transferred to the care of an interventional cardiologist at St. Paul's Hospital only for the purposes of the PTCA procedure and after the procedure, when clinically stable, were transferred back to the care of their referring cardiologist. The task of providing detailed medical information and follow-up of cardiovascular risk factors in most situations was deferred to the referring physician, whereas the referring physician may have assumed that this information was provided at the time of the PTCA procedure or recovery. The reluctance to tread upon the perceived jurisdiction of others also limits opportunities to provide risk information.

The repercussions of inadequately communicated risk messages from health-care professionals are not necessarily benign. Misdirected messages may lead to erroneous decisions (through errors of omission or commission) or contribute to confusion and conflict that may cause anxiety or complacency (Fischhoff et al., 1993). Anxiety and psychological distress, as consequences of being identified "at risk" for a disease or outcome, have been studied in the context of cancer and genetic testing. Individuals who exhibit characteristics and behaviour reflecting hypervigilance and high levels of monitoring in response to risk information may be more susceptible to increased and sustained levels of psychological distress (Lerman & Schwartz, 1993; Wardle et al., 1993). In some situations, anxiety and distress may interfere with adhering to beneficial surveillance practices such as mammography or self-breast examinations (Alagna, Morokoff, Bevett, & Reddy, 1987; Lerman et al., 1993). Even inaccurate perceptions of risk (such as women overestimating their risk for developing breast cancer) may result in high levels of psychological distress (Lerman et al., 1996). In the context of cardiac disease, it is unclear how individuals cope with risk information or what implication misperceptions have for risk reduction behaviour. It is noteworthy that in this study, although not statistically significant, 45% of those who exercised daily were optimistic about their 5-year survival compared to 37% of those who never exercised. Similarly, only 17% of those who had smoked within the past five years were optimistic, compared with 37% of those who had not smoked.

It is unclear why there was considerable lack of notation regarding the respondents' cardiovascular risk factors in the medical record. It is recognised that despite the importance of considering all risk factors simultaneously, there is often a failure to collect all of the necessary components of information essential to the delivery of usual medical care (Kottke, Solberg, Brekke, Cabrera, & Marquez, 1997). Why the information was not available (whether related to time constraints, lack of information, confusion about the boundaries of responsibility, or some other explanation) should be elucidated for several reasons. First, risk-factor information that is skilfully assessed and appropriately recorded in the medical record allows all health-care professionals with access to the chart the opportunity to become aware and involved in opportunities to share accurate risk-factor information with the patient. Second, the lack of accurately collected cardiovascular risk information on the medical chart precludes complete and accurate data collection through retrospective chart reviews. Third, not having the information noted on the medical record conveys a strong suggestion to others that information not contained in the medical history may be unimportant.

In this study, the multiplicative effect of more than one cardiovascular risk factor appeared to be relatively well understood with 70% of the respondents aware that having more than one risk factor would increase their risk for cardiovascular disease by "a lot." This must be interpreted cautiously, however, because of the under-reporting of personal risk factors in this study. It is unclear what, if any, personal consideration the respondents gave in relation to having more than one cardiovascular risk factor. Understanding the personal meaning associated with multiple risk factors is necessary because a patient rarely will have only a single risk factor. According to the Canada Heart Health surveys from 1985-1990, 41% of men and 33% of women aged 18 to 74 years had two or more cardiovascular risk factors (Heart & Stroke Foundation of Canada, 1999). Despite the recognition by most respondents in this study that more than one risk factor would increase their cardiovascular risk, one should not assume that this reflects a deeper understanding of the multiplicative nature of risk factors. Typically, the compounding and synergistic effects of multiple risk factors are poorly understood by the general public (Silagy et al., 1993). Rather, this high degree of recognition may simply be reflecting a specific cognitive rationalisation pattern or common sense recognition of "less is better."

Also unknown is whether the respondents had any understanding of the benefits of partial risk reduction. It is not uncommon for individuals to have a categorical "all or nothing" response to defining risk factors, with a higher regard for the absolute elimination of risk rather than a mere reduction of risk (Redelmeier et al., 1993). Although optimal risk reduction would include attending to all modifiable risk factors, in reality, cardiovascular morbidity and mortality may be improved by reducing a single risk factor, despite the continued influence of others.

It is a mistake, however, to assume that dysfunctional processing of risk information messages by a recipient is entirely responsible for biases in the individual's risk perceptions. Errors in risk perceptions may originate in the content or delivery of the risk-information message that is often the jurisdiction of the health-care professional. Problems related to grasping the concept of multiplicativity extend beyond the cognitive abilities of the individuals at risk. It is widely acknowledged that the actual burden of risk that results from multiple risk factors is challenging for health-care professionals to estimate (Grover et al., 1995). Although tools and risk equations exist to assist in the estimation of cardiovascular risk resulting from several co-existing risk factors, these tools are rarely used in clinical practice situations (Pearson, 1998). In light of these shortcomings, it is not surprising that practitioners have difficulty communicating risk information to patients and that patients have difficulty appreciating their risk status.

Accuracy of Risk Perceptions

The estimated incidence of coronary restenosis after PTCA is estimated to be 30 – 60% despite a successful procedure (Califf et al., 1991; Hillegass, Ohman, & Califf, 1994; Popma & Topol, 1990). Although the majority of patients who experience restenosis are symptomatic, restenosis may occur in asymptomatic patients (Califf et al.). Although the advent of stent implantation has reduced restenosis rates compared with balloon angioplasty, restenosis rates between 13% and 32% have been reported after successful coronary stenting. The threat of restenosis and related events after angioplasty is greatest in the first six months post-PTCA (Pitt et al., 1999). In this study, respondents were asked what they thought their chance for requiring another PTCA procedure within the next year, the next 5 years, and ever in the future might be. Almost two thirds of respondents (59.7%) thought there would be absolutely no chance of needing another PTCA procedure in the next year or stated they did not know, and a further 12.7% of respondents thought there could be up to only a 10% chance of needing a repeat PTCA in the next year. Eight respondents (5.8%) overestimated their chance for needing a PTCA in the next year (>60%). All respondents were given information at the time informed consent was obtained regarding their chance for restenosis in the first year post–PTCA. Based on these findings, only 21.6% of the respondents correctly estimated their risk for needing a repeat PTCA in the next year using the liberal estimates of >10% to ≤ 60%. It is estimated that patients recall approximately one half of what has been told to them by a health-care professional immediately following an interaction (Boswell, Pichert, Lorenz, & Schlundt, 1990), even less when they are physically, psychologically or emotionally stressed (Padberg & Padberg, 1990). If the expectation is for patients to make truly informed decisions about invasive procedures, more effort must be directed toward constructing messages that communicate accurate procedural information in an efficient, effective and consistent manner. Going beyond this minimal requirement, if patients are to fully appreciate the effectiveness of invasive procedures, accurately assess their risk status and allow this information to inform their lifestyle choices, more comprehensive patient education programs will be required.

In evaluating the accuracy of perceived risk for cardiovascular death in the next five years, 44.3% of respondents were accurate in their perceptions relative to the severity of their cardiovascular disease, 32.7% were optimistic, and 23.0% were pessimistic. Selected demographic variables (age, gender, education, level of income, depression, and birthplace) and clinical variables (number of previous cardiac procedures, number of previous admissions to hospital, estimated functional class, family history of cardiovascular disease, and total number of lesions) were analysed in relation to accuracy level to identify determinants of accuracy. No relationship was found between these demographic or clinical variables on the level of accuracy. These findings appear to be in contrast with other studies that found level of education, age or gender to be determinants of accuracy. The absence of finding any significant contribution of these variables on the level of accuracy may be a result of a Type II error. A larger sample size may help to overcome this type of error and identify significant determinants of perceptions of cardiovascular death. However, a similar study of 200 randomly selected, elderly residents of Thailand found no association between age, gender, family income or educational level and perceived risk (Pothiban, 1993). Despite the similarity between the findings of these studies, direct comparisons are not possible as the latter study included individuals who did not have heart disease, in a different cultural setting where the level of exposure to cardiovascular risk information is unknown. Further, the prevalence of coronary heart disease and proportion of major cardiovascular disease risk factors in Thailand is lower than the median of similar values found in other developing countries (Tatsanavivat et al., 1998).

Despite the lack of statistically significant relationships between selected demographic or clinical variables on the level of accuracy, some trends did emerge. For example, in relation to sex, nearly twice as many women were pessimistic (37.5%) than were men (19.1%). Other trends emerged in relation to the clinical determinants of accuracy. Over one half of the respondents who had no previous cardiac procedures were accurate in their risk perceptions; this trend was also consistent for respondents who had no prior admissions to hospital.

Duration of CAD diagnosis and age were the only factors with statistical significance that appeared to influence the level of accuracy of the perceived risk for cardiovascular death within the next five years. Respondents with pessimistic and optimistic biases had their diagnosis of heart disease for a longer period of time than the respondents who held accurate perceptions of their risk for cardiovascular death. As the proximity from time of first diagnosis with cardiovascular disease lessened, the respondents became less accurate in their perceptions. It is interesting that the distortions in risk perception occur exclusive of any parameters associated with progression of heart disease (impairment of functional class, number of cardiac procedures, number of previous cardiac hospitalisations, total number of coronary artery lesions). It is conceivable that when first diagnosed with cardiac disease, the respondents either asked questions related to mortality, or were given this information by their physician and because of the close proximity to their diagnosis this information was recalled with more accuracy. In this population, several respondents received their cardiac disease diagnosis in the same admission to hospital as their PTCA. The factor of duration of diagnosis being a significant finding, accompanied by the trend for accurate perceptions for respondents with no prior procedures or previous admissions strengthens this conjecture.

In relation to age, respondents who were accurate in their risk perception were younger than those who were optimistically biased in their risk perceptions. It is interesting that this finding was unrelated to the duration of CAD diagnosis. It is conceivable that younger respondents had a better comprehension and understanding of the knowledge provided to them by their health-care professional than respondents who were older. The older respondents, already surviving to a certain age despite their cardiovascular disease, may have been optimistic in regards to their perceptions of risk of cardiovascular death because of attributing their risk of death to "fate" or other non-cardiac related causes. Additionally, the older respondents in this study may have been optimistically biased because of downward comparison, that is, comparing their situation to the situation of others. Downward comparison among a group of older adults may result in greater optimism because of the increased likelihood of co-morbidity and death due to age-related causes (e.g., "considering my friend who has just had their leg amputated because of diabetes and vascular disease, my outlook looks pretty good"). Other researchers have similarly identified the optimistic biases of older persons in failing health (Staats et al., 1993).

One respondent, a current smoker, had no intention to stop smoking and was identified as having accurate perceptions of his risk for cardiovascular death within the next five years. The process of atherosclerosis is accelerated in individuals who are current smokers; in addition, the incidence of restenosis of dilated lesions is much higher in patients who continue to smoke (Klein & Rosenblum, 1990; Popma & Topol, 1990). It was unexpected that this respondent would hold accurate risk perceptions; continued smoking in the context of optimistic biases or pessimistic biases (leading to fatalistic behaviours) would provide a more logical explanation. Other researchers have observed optimistic biases of smokers in relation to their risk for coronary disease (Naslund et al., 1996; Strecher et al., 1995). One possible explanation for this finding is that the nomogram used to estimate 5-year survival failed to take into account smoking status, and therefore overestimated this respondent's 5-year survival. If smoking status had been included in the derivation of the 5-year survival score, lowering his probability of survival, this respondent would have been re-classified as optimistic.

Misrepresentations of Lifestyle Behaviour

It is known that adoption of healthful lifestyle behaviours (absence of smoking, reduced intake of dietary fat, and adherence to a regular regimen of exercise) is frequently recommended as a treatment strategy for patients diagnosed with cardiovascular disease. In this study, respondents were asked questions about lifestyle behaviours such as, diet, exercise, smoking and obesity. Open-ended and direct questions were used to elicit information pertaining to these factors. These different styles of questions were used in an effort to validate the answers provided by self-report. In the analysis, it became apparent that there was discordance between what many respondents reported they were doing to reduce their risks for cardiovascular disease, and what they were actually doing. In relation to diet, 55.0% of the respondents adhering to a high fat/high cholesterol diet stated that they had changed their diet to reduce their cardiovascular risk. Respondents who adhered to a high fat/high cholesterol diet also had varied levels of recognition for high fat diet as a general vs. personal risk factor (70.0% vs. 45.0%, respectively). That is, 70% of respondents who consumed high fat diets knew that such behaviour placed individuals, in general, at risk for cardiovascular disease, but only 45% of these same individuals recognised that the high amount of dietary fat/cholesterol in their own diets was putting them at risk and contributed to their own cardiovascular disease. Of patients with dyslipidemia, 38.8% stated that they had reduced their dietary cholesterol, and 43.8% said that they had reduced their dietary fat; but analysis of their diet reflected a persistent high fat/high cholesterol diet. In relation to exercise, 31.9% of respondents who never exercised and 38% of respondents who exercised two times per week or less all stated they had implemented an exercise regimen to reduce their cardiovascular risk. Sedentary lifestyle was identified as a personal risk factor by only 17% of the respondents who never exercised, and by only 28.6% of the respondents who exercised two times per week or less.

It is unclear why the respondents reported that they were engaging in risk modification activities (low fat diet and regular exercise) to reduce cardiovascular risk, when they revealed contrary behaviours when asked specific questions about their dietary and exercise patterns. One explanation could be social desirability or acquiescence response, whereby the respondents stated whatever they believed to be the appropriate social response whether or not it was truthful. Respondents, feeling vulnerable post-PTCA and perhaps even guilty for not engaging in a lifestyle that might have been recommended to them by their physicians, may have felt obligated to state that they had engaged in some type of behaviour to reduce their cardiovascular risk, with diet and exercise being "generic" or standard responses. An alternative explanation is that these respondents intended to engage in these behaviours upon their discharge from hospital, and answered the questions accordingly.

In relation to other lifestyle variables, only eight of the respondents were current smokers; of these current smokers four planned to stop smoking, one planned to continue smoking, and three did not know what they were going to do in relation to their smoking. All of the current smokers recognised smoking as a personal risk factor, with five of the eight identifying smoking as their most significant risk factor.

Obesity is a powerful cardiovascular risk factor because of its relationship with other risk factors (dyslipidemia, diabetes and hypertension). Reducing obesity may offer improved or enhanced control of these associated risk factors. The respondents' recognition of obesity as a risk factor was vastly underreported both as a general and a personal risk factor despite the majority of obese respondents accurately appraising themselves as being overweight. For example, when asked to appraise their body weight, 70% of respondents with Grade I obesity and 100% of the respondents with Grade II and Grade III obesity all identified themselves as being overweight. However, only14% of all respondents recognised obesity as a risk factor in general, and only 6% of all respondents acknowledged that their obesity had contributed to their own cardiac disease. When asked about current weight loss efforts, 64% of respondents with Grade I obesity, 80.0% of those with Grade II obesity, and the single respondent with Grade III obesity all said that they were trying to lose weight, although only 6% of these respondents stated that they were losing weight to reduce their cardiovascular risk.

Lifestyle parameters related to smoking, diet and exercise were examined to understand what, if any, bearing the level of accuracy of risk perception had on the adoption of healthful lifestyle behaviour. Group comparisons (possession of optimistic, pessimistic and accurate assessments) identified no differences in relation to the adoption of healthful lifestyle behaviour. In a similar study of 732 individuals aged 25 to 65 years with no history of coronary artery disease, diabetes or hypertension, Avis et al. (1989) also found no increased likelihood of behaviour change towards healthier lifestyle in relation to perception of risk, even in individuals who had modified their risk perceptions and become more accurate in their perceptions for risk of MI.

When these findings are examined in the context of the theoretical background of this study, it is apparent that the level of accuracy of risk perceptions, as they were evaluated in this study, do not determine the presence or absence of healthful lifestyle behaviours. Three main reasons may account for the failure of the theoretical framework. First, the Health Belief Model (HBM) suggests a rational, cognitive process (Gebhardt, 1997), but the way in which personal risk perceptions are constructed may be neither logical nor rational. Second, others have suggested that the variables within the HBM lack quantification, therefore the true relationship between the variables and behaviour change is not adequately nor consistently defined (Gebhardt, 1997; Rosenstock, 1990). The third reason why the HBM possibly failed in this study is that the model assumes that health is an equally important goal of all individuals (Gebhardt, 1997). In the present study, this may have been particularly relevant because the sample included a wide range of cultural and ethnic backgrounds, as well as varied medical histories. Further study of risk perceptions is required to determine how the accuracy of risk perceptions affects the likelihood of adopting healthful lifestyle behaviours.

Limitations of the Study

When considering the results of this study, it is important to acknowledge several limitations. Firstly, very little is known about how individuals with heart disease perceive their risks for disease progression and death. Whereas other studies have given significant attention to cardiovascular risk factor knowledge and beliefs, no published work could be found to guide the formulation of the questions for ascertaining perceived risks for cardiovascular disease progression and death. Although we believe the questions developed for this study had adequate face validity, it was not possible to establish the content validity of these questions because of the paucity of related literature. Similarly, it must also be acknowledged that we were unable to find any published report using the nomogram to estimate 5–year survival in addition to the cited reference. However, an informal survey of practising cardiologists, contacted by the investigator, confirmed the usefulness and accuracy of the nomogram to predict 5-year survival, largely because of the inclusion of several important clinical variables.

Secondly, recall biases may have contributed to inaccuracies in the collection of data. Several questions in this study required the respondents to recall information related to past events or diagnoses, or to recall medical information given to them in the past. Although every attempt was made to corroborate responses with information from the medical record, many responses remained unverified.

Closely related to recall bias and a third limitation of this study is the reliance on self-reported variables. Responses to several of the lifestyle related variables pertaining to diet, exercise patterns, alcohol consumption, and smoking were self-reported. Other studies suggest that the validity of self-reported risk factors by telephone surveys is low, especially for hypertension and high cholesterol, and may be related to biases (Bowlin, Morrill, Nafziger, Lewis, & Pearson, 1996). There has been some debate on the validity of self-reported measures of obesity, and several studies have identified that using self reported variables of height and weight may result in underestimation of obesity prevalence (Rowland, 1989; Siegel & Franks, 1993). There may be an even greater underestimation of obesity prevalence with telephone interviews (Bowlin et al.). Taking all of these factors into account, the prevalence of cardiovascular risk factors and grade of obesity within the study population is likely conservatively estimated.

Lastly, although healthful lifestyle behaviour was examined in the context of accuracy of risk perceptions, other factors, such as self-efficacy, that may be associated with the implementation of healthful lifestyle behaviours were not evaluated. Theories of self-efficacy complement the Health Belief Model and consist of the beliefs an individual holds about their ability to carry out or succeed with a specific task or situation (Miller & Rollnick, 1991). Some studies have found no direct relationship between self-efficacy and risk perceptions (Strecher et al., 1995), and others have found that perceiving risk in the face of low self-efficacy may result in denial or defensiveness (Rogers & Mewborn, 1976). An evaluation of the respondents' level of self-efficacy regarding their ability to adopt healthful lifestyle behaviours may have provided insights to inform the theoretical background of the study.

Recommendations

Much of the research done in the area of perceptions of disease risk has been conducted in healthy populations or in those at risk for cancer or genetic disease. It is unclear if biases in risk perceptions exist because of errors in cognitive processing, or because of defence mechanisms such as denial. Additionally, the key determinants of adherence to a healthful lifestyle are unknown. What makes individuals at risk more and less inclined to participate in healthful lifestyle choices? Three key recommendations emerge from this study.

First, health-care professionals should strive to move beyond simply providing information and should engage patients in discussions that personalise risk messages. There should be sufficient epidemiologic evidence to support the risk messages, but the impelling content of the message should be related specifically to the individual-at-risk's situation and risk-factor profile. Further, the health-care professional is responsible for ensuring that the content of the message is appropriate for the intended audience. The onus should not be placed upon the recipient of the message to understand technical or scientific information, but rather the health-care professional should be committed to delivering clear, concise, and simple risk-information messages. Nurses are uniquely positioned to deliver accurate, well-formed health messages because of their close proximity to cardiac patients in a variety of clinical settings (ranging from acute care to out-patient cardiac rehabilitation settings).

Second, despite the availability of guidelines for assessment of and intervention for cardiovascular risk factors, a treatment gap exists between the recommendations of these guidelines and how individuals at risk are actually treated. For example, recent evidence suggests that only 55% of men and 35% of women with coronary artery disease are on lipid lowering therapy for elevated cholesterol, although there is wide recognition of the importance of this therapy (Frohlich, McPherson, Genest, & Langner, 1998). Of those on lipid lowering therapy, only 31% of men and 12% of women are treated to the appropriate target levels (Miller, Byington, Hunninghake, Pitt, & Furberg, 2000). Although it is acknowledged that clinical judgement should not be superseded by clinical guidelines, efforts to use clinical practice guidelines for cardiovascular risk factor management will serve as a foundation for optimal, comprehensive care.

A third and final recommendation is to reconsider previously held assumptions that socio-economic status, level of education, gender, or psychological variables are the primary determinants of accuracy of an individual's perceptions of cardiac disease risk. More important, perhaps, is to consider the length of an individual's diagnosis or the age of the individual. These considerations may be of particular importance because current treatment options for cardiac patients offer improved prognoses related to both morbidity and mortality, and consequently individuals will be living longer with cardiac disease, and likely to live to advanced ages. Much of the health education currently provided to cardiac patients is offered at the time of initial diagnosis with little comprehensive and planned continuing education. In light of the evidence that perceptions become inaccurate over time, there is merit to a recommendation that cardiac rehabilitation programs extend their health education activities to patients with longstanding cardiac diagnoses.

Considering the findings of this study, further research into how risk perceptions are constructed, beyond age and duration of cardiac diagnosis, is warranted. Further study in identifying the barriers to implementing healthful lifestyle behaviours is also needed. Understanding how individuals with cardiovascular disease perceive their risks relative to this disease process will help to optimise cardiovascular disease prevention and risk reduction efforts.

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STUDY TITLE: **Correlates of Coronary Angioplasty Patients' Perceptions of Their Risk**

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ID#		

We are interested in understanding about what this angioplasty means to you. These first few questions are related to your angioplasty procedure and your experience having heart disease.

1. **An angioplasty is done to correct a blockage in your artery. Do you think having an angioplasty will result in the following (these are yes or no answers):** *(RA: read response)*

   a) You will have fewer symptoms now ☐yes ☐no

   b) You will live a longer life ☐yes ☐no

   c) You will be able to do more activities now ☐yes ☐no

   d) You will have less chance of having a heart attack (or another) ☐yes ☐no

2) **Are there other ways this angioplasty will affect your health?** *(RA: list response)*

3) **Have you received the results of your angioplasty procedure?**

   a) ☐Yes

   b) ☐No (go to question #5)

   c) ☐Don't Know (go to question #5)

4) **What did your doctor tell you about the results of your angioplasty?** *(RA: specify)*

5) **On a scale of 0% to 100%, where "0%" means there is absolutely no chance and "100%" means it definitely will happen, what are the chances you will need to have another angioplasty?** *(RA: read response, use flashcard)*

   a) In the next year________________________________

   b) In the next 5 years________________________________

   c) Ever again in your lifetime, more than 5 years from now__________________________

6) Can you describe for me what the angioplasty has done to the blockage in your coronary artery? *(RA: do not read response, check all that apply, accept numerous responses)*

a) ☐A balloon has pushed the blockage out of the way

b) ☐A balloon has pressed the blockage and flattened it so that it does not block the artery

c) ☐A balloon has sucked out the blockage

d) ☐Other (Specify):______________________________

7) In general, what are the causes of heart disease? *(RA: do not read response, check all that apply, prompt respondent for other causes:* **"Are there other causes?")**

a) ☐Heredity (family history)

b) ☐Smoking

c) ☐High cholesterol

d) ☐Too much fat in the diet

e) ☐High blood pressure

f) ☐Diabetes

g) ☐Stress

h) ☐Other (specify):__________________

8) In your specific situation, what do you think has caused <u>your</u> heart disease? *(RA: do not read response, check all that apply, prompt respondent for other causes:* **"Are there other causes?"***)*

a) ☐Heredity (family history)

b) ☐Smoking

c) ☐High cholesterol

d) ☐Too much fat in my diet

e) ☐High blood pressure

f) ☐Diabetes

g) ☐Stress

h) ☐Other (specify

9) What is the <u>most significant</u> factor that has caused your heart disease? *(RA: prompt with reminding what was listed for question #8)*

10) What we have just talked about are called "risk factors". Does having more than one risk factor increase the chance for having heart disease? For example, suppose a person already has high cholesterol, would also having *(name one of the risk factors named in question # 8)* **increase the chance of developing heart disease?**

a) ☐Yes

b) ☐No (go to question #12)

c) ☐Don't know (go to question #12)

11) Would having more than one risk factor increase the chance of developing heart disease by…

a) ☐A little

b) ☐A lot

c) ☐Don't know

12) Do you think it is possible to reduce your chance for developing more heart disease?

a) ☐Yes

b) ☐No (go to question #14)

c) ☐Don't know

13) What are some of the things you have done to reduce your chance for developing more heart disease? (RA: list response)

14) In the past, have you undergone any other cardiac procedures to help your heart?

*(Prompt: **Have you had any other procedure to fix blockages in your coronary arteries**?)*

a) ☐No (go to question #16)

b) ☐Don't know (go to question #16)

c) ☐Yes, angioplasty

d) ☐Yes, bypass surgery

e) ☐Yes, Other (specify):______________________________

15) What year(s) did you have these procedures

a) ☐PTCA______________________

b) ☐CABG______________________

c) ☐Other______________________________*(specify procedure & year done)*

16) What year did you <u>first</u> find out you had heart disease? *(RA: if states* **1999***, prompt for month)*

____

17) Since you were first diagnosed with heart disease, how many times have you been admitted to the hospital overnight because of your heart?

____

18) On a scale from 0 to 10, where 0 is "not at all severe" and 10 is "very severe", how severe is your heart disease? *(RA: show flashcard)*

____

19) Now we are going to change the scale for this next question. On a scale of 0% to 100%, where "0%" means there is absolutely no chance and "100%" means it definitely will happen, what is the chance of your heart disease progressing or getting worse...

(RA: read response and show flashcard)

a) In the next year____________________________________

b) In the next 5 years____________________________________

c) Ever again in your lifetime, more than 5 years from now________________________

20) Do you have a family history of heart disease?

a) ☐Yes

b) ☐No

c) ☐Don't know

21) How many <u>blood</u> relatives have had a heart attack or stroke? *(RA: may suggest* **"biological family members")**

____

What was their relationship to you and how old were they when they first found out?

Nature of relationship	Age	Nature of relationship	Age

22) Based on what you know about heart disease and your health, on a scale of 0% to 100%, where "0%" means there is absolutely no chance and "100%" means it definitely will happen, what is your chance of dying from heart disease...? *(RA: read response)*

a) In the next year?____________________________

b) In the next 5 years?____________________________

c) Sometime in the future, more than 5 years from now? __________________________

These next few questions are about your mood and generally how you feel about things. These are all yes or no questions.
23) Are you basically satisfied with your life? a) ☐ yes b) ☐ no
24) Have you dropped many of your activities and interests? a) ☐ yes b) ☐ no
25) Do you feel that your life is empty? a) ☐ yes b) ☐ no
26) Do you often get bored? a) ☐ yes b) ☐ no
27) Are you in good spirits most of the time? a) ☐ yes b) ☐ no
28) Are you afraid that something bad is going to happen to you? a) ☐ yes b) ☐ no
29) Do you feel happy most of the time? a) ☐ yes b) ☐ no
30) Do you often feel helpless? a) ☐ yes b) ☐ no
31) Do you prefer to stay at home rather than going out and doing new things? a) ☐ yes b) ☐ no
32) Do you feel that you have more problems with memory than most? a) ☐ yes b) ☐ no
33) Do you think it is wonderful to be alive? a) ☐ yes b) ☐ no

34) Do you feel pretty worthless the way you are now?

a) ☐ yes

b) ☐ no

35) Do you feel full of energy?

a) ☐ yes

b) ☐ no

36) Do you feel that your situation is hopeless?

a) ☐ yes

b) ☐ no

37) Do you think that most people are better off than you are?

a) ☐ yes

b) ☐ no

These next questions are about your lifestyle; things that you may do to improve your health.

38) Were you ever told by a doctor, nurse or other health professional that your blood cholesterol was high? *(RA: prompt:* **"This would require a blood sample"**)

a) ☐Yes **Year found out______________** ***if 1999, state month*________________**

b) ☐No

c) ☐Don't know

39) Are you doing anything to control your cholesterol?

a) ☐Yes

b) ☐No (go to question #41)

40) What are some of the things you do to try to control your cholesterol?
(RA: do not read response, check all that apply)

a) ☐Losing weight or maintaining weight loss

b) ☐Reduce cholesterol in diet

c) ☐Eat less fatty foods

d) ☐Other changes in diet

e) ☐Exercise regularly

f) ☐Control stress and fatigue

g) ☐Take prescribed medication

h) ☐Other (specify):________________

41) Are you trying to lose weight?

a) ☐Yes

b) ☐No

42) Do you consider yourself… *(RA: read response)*

a) ☐Overweight?

b) ☐Underweight? (go to question #44)

c) ☐Just about right? (go to question #44)

43) Would you say you are… *(RA: read response)*

a) ☐Very overweight?

b) ☐Somewhat overweight?

c) ☐Only a little overweight?

44) As far as you know, is your blood pressure… *(RA: read response)*

a) ☐Normal

b) ☐Borderline

c) ☐High but now normal with medication

d) ☐High

45) Are you doing anything to control your blood pressure?

a) ☐Yes

b) ☐No (go to question #47)

46) What do you do to control your blood pressure? *(RA:Do not read response, check all that apply)*

a) ☐exercise

b) ☐medication

c) ☐limit salt

d) ☐reduce stress

e) ☐lose weight

f) ☐other (specify):____________________

47) Have you ever been told by a doctor, nurse or other health professional that you have diabetes?

a) ☐Yes **Year found out**________________ **if 1999, state month**____________

b) ☐No (go to question #50)

c) ☐Don't know (go to question #50)

48) How do you manage your diabetes? *(RA: do not read response, prompt with "***Do you monitor your blood sugar levels?*** Check all that apply)*

a) ☐self-monitor blood glucose level

b) ☐blood glucose level monitored by MD

c) ☐blood glucose level monitored by other:

(specify) ______________________________

d) ☐watch my diet

e) ☐take pills

f) ☐take insulin

g) ☐lost weight

h) ☐exercise

49) Is there anything else you do to manage your diabetes? (RA: list response)

50) Have you smoked any cigarettes in the last five years?

a) ☐Yes

b) ☐No (go to question #55)

51) Are you still smoking cigarettes?

a) ☐Yes (go to question #53)

b) ☐No

52) What year did you smoke your last cigarette?__________________

(RA: if states "1999" prompt for month) _________________ *(go to question #55)*

53) Are you planning to stop smoking?

a) ☐Yes

b) ☐No (go to question #55)

c) ☐Don't know (go to question #55)

54) When do you plan to stop smoking? *(RA: list response)*

The following questions are about your diet. Identify the answer which best describes the way you have been eating over the past month.

55) How many ounces of meat, fish or poultry do you usually eat per day? A 3 oz. portion is about the size of my palm. *(RA: hold up palm to demonstrate, if still unclear read * below). (Read responses)*

a) ☐ You do not eat meat, fish or poultry

b) ☐ You eat 3 ounces (85 grams) or less per day

c) ☐ You eat 4 – 6 ounces (113 to 170 grams) per day

d) ☐ You eat 7 or more ounces (198 grams or more) per day

***3 ounces of meat or fish portion size approximately the size of a deck of cards; 3oz of chicken is one half of a chicken breast or 1 small chicken leg (thigh & drumstick), 3 slices of pre-sliced luncheon meat**

56) How much cheese do you eat per week? *(RA read responses)*

a) ☐ You do not eat cheese

b) ☐ You eat whole milk cheese less than once a week and/or use only low fat cheese such as diet cheese, low fat cottage cheese or ricotta

c) ☐ You eat whole milk cheese once or twice per week (such as cheddar, swiss, monterey jack)

d) ☐ You eat whole milk cheese three or more times per week

57) What type of milk do you use? *(RA read responses)*

a) ☐ You use only skim or 1% milk, or don't use milk

b) ☐ You usually use skim milk or 1% mild but use others occasionally

c) ☐ You usually use 2% or whole milk

58) How many visible egg yolks do you use per week? *(RA read responses)*

a) ☐ You avoid all egg yolks or use less than one per week and or use only egg substitutes

b) ☐ You eat 1-2 egg yolks per week

c) ☐ You eat 3 or more egg yolks per week

59) How often do you eat these meats: regular hamburger, bologna, salami, hot dogs, corned beef, spareribs, sausage, bacon, or liver? Do not count others. *(RA read responses)*

a) ☐ You do not eat any of these meats

b) ☐ You eat them about once per week or less

c) ☐ You eat them about 2 to 4 times per week

d) ☐ You eat more than 4 serving per week

60) How many commercial baked goods and how much regular ice cream do you usually eat? (Examples: cakes, cookies, coffee cake, sweet rolls, donuts, etc. Do not count low fat versions) (RA read responses)

a) ☐ You do not eat commercial baked goods and ice cream

b) ☐ You eat commercial baked goods or ice cream once per week or less

c) ☐ You eat commercial baked goods or ice cream 2 to 4 times per week

d) ☐ You eat commercial baked goods or ice cream more than 4 times per week

61) What is the main type of fat that you cook with? *(RA read responses)*

a) ☐ You use non-stick spray or I do not use fat in cooking

b) ☐ You use a liquid oil (examples: safflower, sunflower, corn, soybean, and olive oil)

c) ☐ You use margarine

d) ☐ You use butter, shortening, bacon drippings, or lard

62) How often do you eat snack foods such as chips, fries or party crackers? *(RA read responses)*

a) ☐ You do not eat these snack foods

b) ☐ You eat one serving of these snacks per week

c) ☐ You eat these snacks 2 to 4 times per week

d) ☐ You eat these snack foods more than four times per week

63) What spread do you usually use on bread or vegetables? *(RA read responses)*

a) ☐ You do not use any spread

b) ☐ You use diet or light margarine

c) ☐ You use margarine

d) ☐ You use butter

64) How often do you eat as a snack, candy bars, chocolate, or nuts? *(RA read responses)*

a) ☐Less than once per week
b) ☐One to 3 times per week
c) ☐More than 3 times per week

65) When you use recipes or convenience foods, how often are they low fat? *(RA read responses)*

a) ☐almost always
b) ☐usually
c) ☐sometimes
d) ☐seldom or never

66) When you eat away from home, how often do you choose low fat foods? *(RA read responses)*

a) ☐almost always
b) ☐usually
c) ☐sometimes
d) ☐seldom or never

The next few questions are about exercise. By exercise, I mean vigorous activities such as aerobics, jogging, racquet sports, team sports, dance classes or brisk walking; this does not include activities of housework, gardening and yard work.

67) How many times per week, on average, do you do an activity specifically for the purpose of exercise? *(RA: do not read response)*

a) ☐daily
b) ☐5-6 times per week
c) ☐3–4 times per week
d) ☐1-2 times per week
e) ☐less than once per week
f) ☐never
g) ☐other (specify)

68) When you do this exercise, how much time are you actually active? Would it be…

a) ☐Less than 15 minutes?
b) ☐Between 15 and 30 minutes?
c) ☐More than 30 minutes?

69) Do you feel that you get as much exercise as you need or less than you need?

a) ☐As much as needed
b) ☐Less than needed
c) ☐don't know

70) What sort of activities do you do for exercise? (RA: list response)

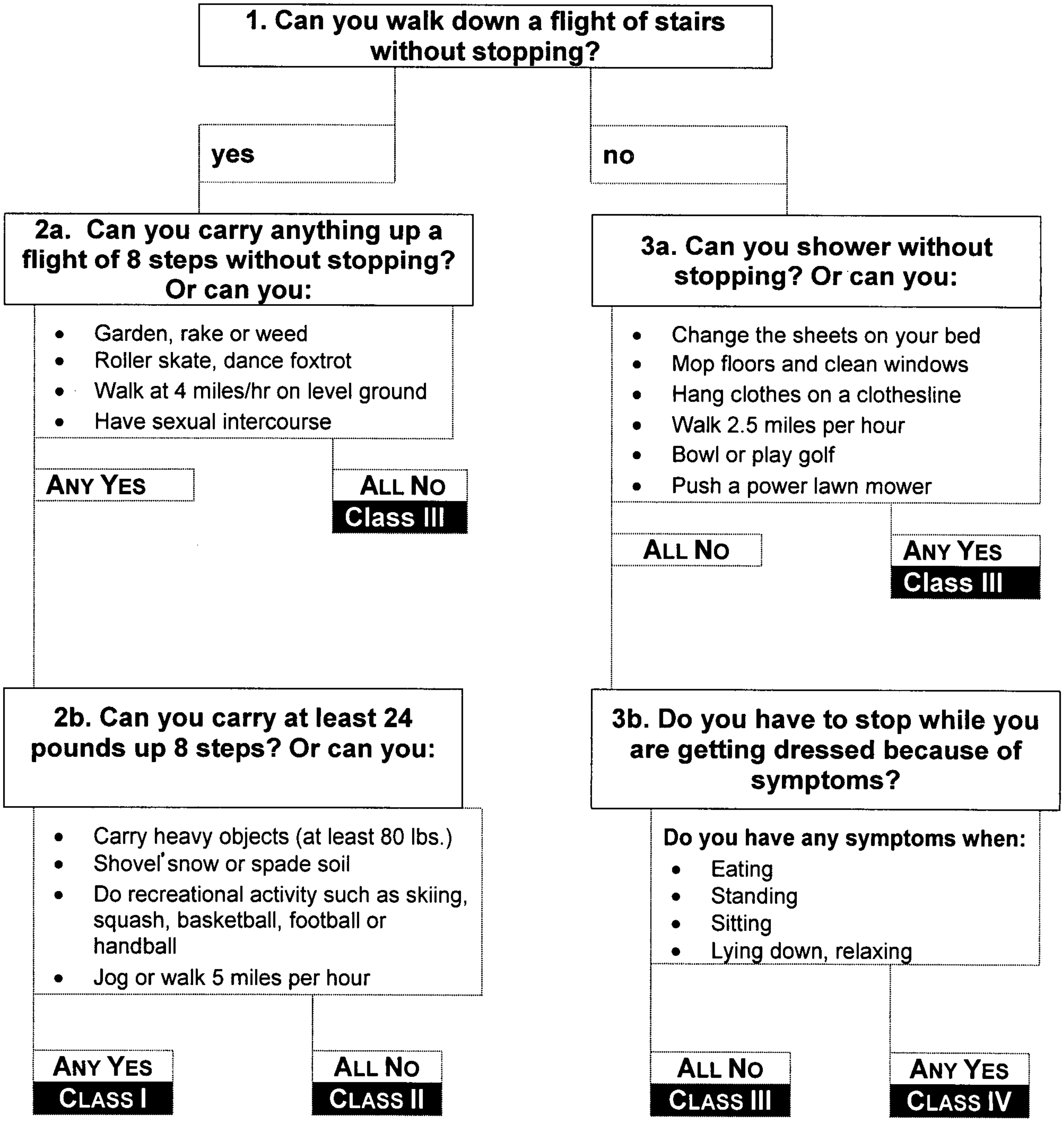
71) Approximately how tall are you without your shoes on?

____

72) Approximately how much do you weight?

______________________________ ☐lbs. ☐kg

73) THE SPECIFIC ACTIVITY SCALE



RA: *Circle responses and indicate class*

Now I would like to ask you some questions about alcohol consumption. In the next questions, when I use the word "drink" it means:

- One bottle or can of beer or a glass of draft
- One glass of wine or a wine cooler
- One straight or mixed drink with one and a half ounces of hard liquor

74) Have you <u>ever</u> taken a drink (beer, wine, liquor or other alcoholic beverage)?

a) ☐Yes

b) ☐No (go to question #78)

c) ☐Don't know (go to question #78)

75) During the past 12 months, have you had a drink of beer, wine, liquor or any other alcohol beverage?

a) ☐Yes

b) ☐No (go to question #78)

76) During the past 12 months, how often, on average, have you had drinks with alcohol *(RA: read response, prompt to most accurate category)*

a) ☐every day

b) ☐4-6 times a week

c) ☐ 2-3 times a week

d) ☐ once a week

e) ☐ 2 – 3 times a month

f) ☐ once a month

g) ☐ less than once a month

77) During the past 6 months, how often have you had 2 or more drinks containing alcohol in one day? *(RA: read response, prompt to most accurate category)*

a) ☐every day

b) ☐5-6 times a week

c) ☐3-4 times a week

d) ☐1-2 times a week

e) ☐1–3 times a month

f) ☐3-5 times in 6 months

g) ☐1-2 times in 6 months

h) ☐never

These last few questions pertain to your background and some general household information

78) In what country were you born?

a) ☐Canada (go to question #80)
b) ☐China
c) ☐France
d) ☐Germany
e) ☐Greece
f) ☐Guyana
g) ☐Hong Kong
h) ☐Hungary
i) ☐India
j) ☐Italy
k) ☐Jamaica
l) ☐Japan
m) ☐Netherlands
n) ☐Philippines
o) ☐Poland
p) ☐Portugal
q) ☐United Kingdom
r) ☐United States
s) ☐Vietnam
t) ☐Other (specify):

79) In what year did you first immigrate to Canada? ____________________

80) Excluding kindergarten, how many years of elementary and high school combined have you successfully completed?

a) ☐No schooling
b) ☐One to five years
c) ☐Six
d) ☐Seven
e) ☐Eight
f) ☐Nine
g) ☐Ten
h) ☐Eleven
i) ☐Twelve
j) ☐Thirteen

81) Have you graduated from high school?

a) ☐Yes
b) ☐No

82) Have you ever attended any other kind of school such as university, community college, business school, trade or vocational school, or other post-secondary institution?

a) ☐Yes
b) ☐No(go to question #84)

83) What is the highest level of education you have attained?

a) ☐Some trade, technical, vocational school or business college
b) ☐Some community college, CEGEP or nursing school
c) ☐Some university
d) ☐Diploma or certificate from trade, technical or vocational school or business college
e) ☐Diploma or certificate from community college, CEGEP or nursing school
f) ☐Bachelor's or undergraduate degree or teacher's college (e.g., BA, BSc, LLB)
g) ☐Master's degree (e.g., MA, MSc, Med)
h) ☐Degree in medicine, veterinary medicine or optometry (MD, DDS, DMD, DVM, OD)
i) ☐Earned doctorate (e.g., PhD, DSc, DEd)
j) ☐Other (specify):

84) What is your current marital status?

a) ☐Now married
b) ☐Common-law/live-in partner
c) ☐Single (never married)
d) ☐Widowed
e) ☐Separated
f) ☐Divorced

85) What do you consider to be your current main activity (For example, working for pay, caring for family) *(RA: do not read list)*

a) ☐Caring for family
b) ☐Working for profit or pay
c) ☐Caring for family and working for pay or profit
d) ☐Going to school
e) ☐Recovering from illness/on disability
f) ☐Looking for work
g) ☐Retired
h) ☐Other (specify):

86) Canadians belong to many ethnic or cultural groups such as Irish, Scottish, French, or Chinese. To which ethnic or cultural groups do you belong? *(RA: accept multiple responses, do not probe)*

87) What is your best estimate of total income before taxes and deductions <u>of all household members</u> from all sources in the past 12 months? *(RA: show flashcard)*

88) How many household members do you have?________________________________

PART II: OBJECTIVE CLINICAL DATA MSP # ☐☐☐☐ ☐☐☐ ☐☐☐

89) Date of Birth	**90) Postal Code**
91) Age	**92)** ☐ male ☐ female
93) Occupation:	

94) CHD risk factors identified in medical history by MD*(include 'negative'risk factors..i.e. non-smoker, no diabetes)*

a) ☐ family history
b) ☐ smoking
c) ☐ HTN
d) ☐ diabetes
e) ☐ dyslipidemia
f) ☐ sedentary lifestyle
g) ☐ obesity
h) ☐ stress
i) ☐ other (specify

95) Blood Pressure ____________________ ☐*medical history or* ☐*assessment/graphic sheet*

96) Coronary Artery Anatomy (angiogram) ☐*St. Paul's Hospital* ☐*Other (specify):*____________

☐ ***Previous CABG***

☐**LM**______________________________ ☐*"normal"*

☐**LAD**______________________________ ☐*"normal"*

☐**CIRC**______________________________ ☐*"normal"*

☐**RCA**______________________________ ☐*"normal"*

☐**Bypass grafts**______________________________ ☐*"normal"*

☐**Other**______________________________

97) Procedural information: Date of procedure:________________________

1)Pre-R$_x$:__________***%*** ***Post-R$_x$***__________***%*** ***Location*** ____________________

2)Pre-R$_x$:__________***%*** ***Post-R$_x$***__________***%*** ***Location*** ____________________

3)Pre-R$_x$:__________***%*** ***Post-R$_x$***__________***%*** ***Location*** ____________________

Other:

98) Relevant Lab work: ☐SPH Lab ☐other Lab

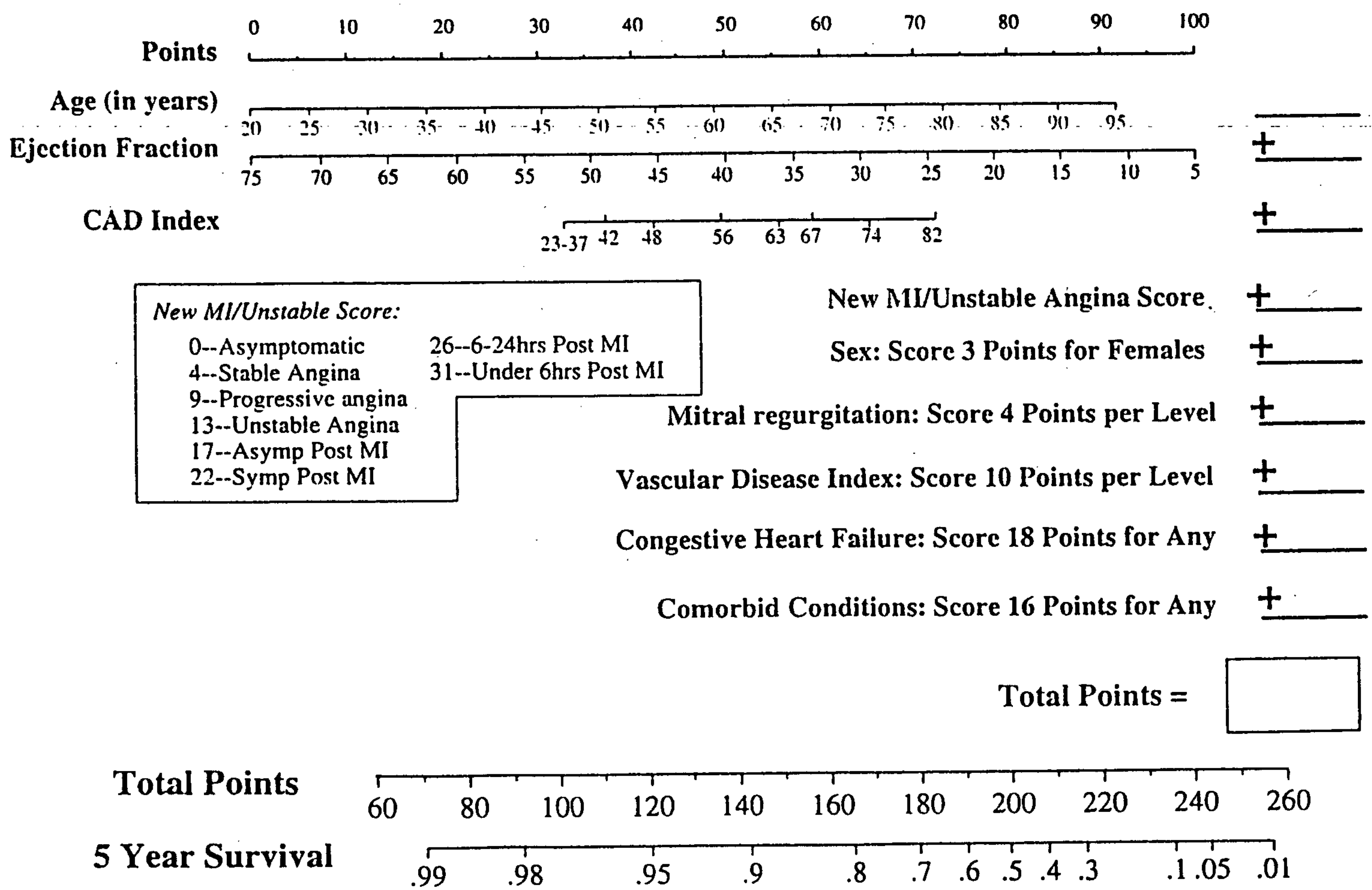
a) TC____________	f) HgbA1C___________
b) LDL-C__________	g) Hgb______________
c) HDL-C__________	h) Creatinine___________
d) TG_____________	i) Other_________________________________
e) FBS____________	j) Other_________________________________

99) Pattern of Angina pre-procedure

a) ☐ Asymptomatic
b) ☐ Stable angina (exertional)
c) ☐ Progressive angina (increased frequency, intensity of discomfort)
d) ☐ Unstable angina (occurs at rest)
e) ☐ Symptomatic Post MI (at least one episode of CP >24 hours post MI, prior to discharge)
f) ☐ 6 – 24 hours Post MI

100) Estimated ejection fraction_____________	d)☐ other (specify):
a) ☐ LV angio b) ☐Echo c) ☐MIBI	e)☐ information not available
101) Mitral Regurgitation	b) ☐absent
a) ☐present grade_____________	c) ☐ information not available
102) Any episode of heart failure?	b) ☐no, never any episode
a) ☐yes, at least once episode in the past	c) ☐ information not available
103) Cardiac History (year dx, if 1999, include month.	d) ☐Other:
a) ☐MI *(location)*_________________________	______________________________
b) ☐MI *(location)*_________________________	______________________________
c) ☐Angina____________________________	______________________________
104) Any other vascular disease? (year dx, if 1999, include month)	d) ☐Thrombotic/Embolic event
a) ☐TIA	e) ☐Other:
b) ☐CVA	______________________________
c) ☐PVD/Claudication	______________________________
	______________________________

105) Comorbidity: a) ☐Asthma/COPD b) ☐malignancy c) ☐diabetes d) ☐Renal Insufficiency/Failure	e) Other:____________________ ____________________ ____________________ ____________________ ____________________
106) Other medical history	
107) Current medications as noted in medical history: a) ASA________________ b) β-blocker________________ c) ACE-Inhibitor________________ d) Ca-Channel blocker________________ e) Lipid ________________ f) HRT________________	g) ________________ h) ________________ i) ________________ j) ________________ k) ________________ l) ________________



Califf, R.M., Armstrong, P.W., Carver, J.R., D'Agostino, R.B., & Strauss, W.E. (1996). Stratification of patients into high, medium, and low risk subgroups for purposes of risk factor management. Journal of the American College of Cardiology, 27, 1007-1019.

Coronary Artery Disease Prognostic Index

Extent of CAD	Prognostic Weight (0–100)	5-yr Mortality Rate (%)*
1-vessel disease, 75%	23	7
>1-vessel disease, 50–74%	23	7
1-vessel disease, ≥95%	32	9
2-vessel disease	37	12
2-vessel disease, both ≥95%	42	14
1-vessel disease, ≥95% proximal LAD	48	17
2-vessel disease, ≥95% LAD	48	17
2-vessel disease, ≥95% proximal LAD	56	21
3-vessel disease	56	21
3-vessel disease, ≥95% in at least 1	63	27
3-vessel disease, 75% proximal LAD	67	33
3-vessel disease, ≥95% proximal LAD	74	41

*Assuming medical treatment only. CAD = coronary artery disease; LAD = left anterior descending coronary artery.

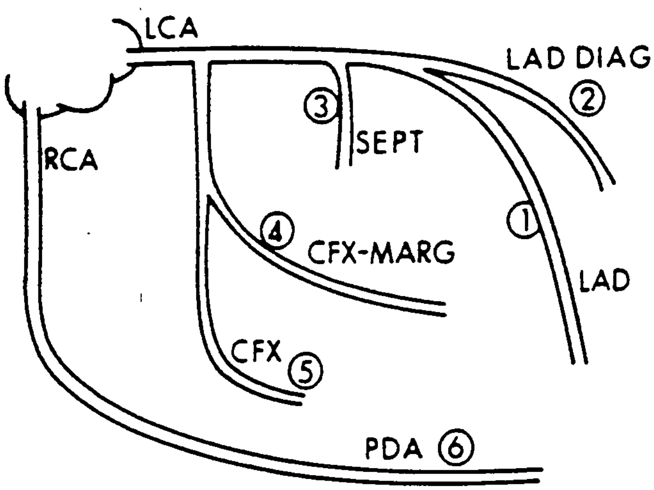


Figure 1. Diagram of coronary artery tree demonstrating the six segments counted in the jeopardy score. CFX = left circumflex coronary artery; CFX-MARG = major marginal branch of the left circumflex coronary artery; LAD = left anterior descending artery; LAD DIAG = major diagonal branch of the left anterior descending artery; LCA = left main coronary artery; PDA = posterior descending coronary artery; RCA = right coronary artery; SEPT = major septal perforating artery.

Mark, D.B., Nelson, C.L., Califf, R.M., Harrell, F.E. Jr., Lee, K.L., Jones, R.H., Fortin, D.F., Stack, R.S., Glower, D.D., & Smith, L.R. (1994). Continuing evolution of therapy for coronary artery disease: Initial results from the era of coronary angioplasty. Circulation, 89, 2015-2025.

Risk of Mortality at 1 Year: Clinical History Variables

1. Find Points for Each Risk Factor:

Age (yr)	Points	Angina (pain type)	Points	Comorbid Factor	Points*
20	0	Nonanginal pain	3	CVD	20
30	13	Atypical angina	25	PVD	23
40	25	Typical angina		Diabetes	20
50	38	Stable	41	Prior MI	17
60	50	Progressive	46	Hypertension	8
70	62	Unstable	51	Mitral regurgitation	
80	75			Mild	19
90	88			Severe	38
100	100				

2. Sum Points for All Risk Factors:

_____ + _____ + _____ = _____
Age + Pain score + Comorbidity = Point total

3. Look Up Risk Corresponding to Point Total:

Total Points	Probability of 1-yr Death	Total Points	Probability of 1-yr Death
84	1%	199	30%
106	2%	211	40%
120	3%	220	50%
136	5%	229	60%
160	10%		
184	20%		

*Zero points for each "no." CVD = cerebrovascular disease; MI = myocardial infarction; PVD = peripheral vascular disease.

Califf, R.M., Armstrong, P.W., Carver, J.R., D'Agostino, R.B., & Strauss, W.E. (1996). Stratification of patients into high, medium, and low risk subgroups for purposes of risk factor management. Journal of the American College of Cardiology, 27, 1007-1019.

Stratification of Risk for Progression of Atherosclerosis

Risk Factor	*Lowest Risk Level*	*Moderate Risk Level*	*Highest Risk Level*
Smoking	None	Recent smoking cessation (< months)	Current smoker
LDL Cholesterol/Diet	Diet*	Diet*	Diet*
	< 20% Fat	20–29% Fat	>29% Fat
	< 7% Sat fat	7–10% Sat fat	> 10% Sat fat
	< 150 mg Chol	150–300 mg Chol	> 300 mg Chol
	or	or	or
	LDL Cholesterol	LDL Cholesterol	LDL Cholesterol
	LDL< 100 mg/dL	LDL = 100–129 mg/dL	LDL > 130 mg/dL
Diabetes Mellitus	Hb A1c < 7% or FBG < 120 mg/dL	Hb A1c = 7–9% or FBG = 120–180 mg/dL	Hb A1c > 9% or FBG > 180 mg/dL
Weight	BMI < 25	BMI = 25–29	BMI ≥ 30
HTN	SBP < 130 mm Hg	SBP = 130–159 mm Hg	SBP ≥ 160 mm Hg
	DBP < 85 mm Hg	DBP = 85–99 mm Hg	DBP ≥ 100 mm Hg
Depression	No clinical depression	Moderate clinical depression	Significant clinical depression
Exercise	>6300 kJ/wk	2940–6300:8 kJ/wk	< 2940 kJ/wk

BMI: body mass index; CHF: Congestive heart failure; Chol: cholesterol; DBP: diastolic blood pressure; EF: ejection fraction; FBG: fasting blood glucose; Kcal/Wk: kilocalorie per week; HDL: high-density lipoprotein; HTN: hypertension; LDL: low-density lipoprotein; LV: left ventricular; MI: myocardial infarction; Sat fat: saturated fat; SBP: systolic blood pressure.
*Diet: survey used to determine content; 2 of 3 measures classify person in category.

Roitman, J.L., LaFontaine, T., & Drimmer, A.M. (1998). A new model for risk stratification and delivery of cardiovascular rehabilitation services in the long-term clinical management of patients with coronary artery disease. Journal of Cardiopulmonary Rehabilitation, 18, 113-123.