EFFECTS OF AN IN-HOSPITAL CARDIOVASCULAR RISK FACTOR MANAGEMENT STRATEGY POST ACUTE MYOCARDIAL INFARCTION

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Effects of an In-Hospital Cardiovascular Risk Factor Management Strategy Post Acute Myocardial Infarction

By

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Abstract

OBJECTIVES: To determine the effectiveness of an in-hospital cardiovascular risk management strategy in Acute Myocardial Infarction patients and to assess roles and responsibilities of cardiology staff for risk factor management.

METHODS: A descriptive study, based on chart reviews, compared risk factor identification, documentation and management before and after implementation of a risk management strategy. Perceived roles and responsibilities of cardiology staff were determined through surveys.

RESULTS: The strategy was partially effective. One of seven variables for risk identification and documentation (history of coronary artery disease) achieved statistical significance ($p < 0.04$). Four of eight management variables (lipid measurement, statin drug utilization, stress counseling and smoking counseling) achieved statistical significance ($p < 0.001$). Cardiology staff was in near total agreement (98%) with the need for a team approach for in-hospital risk management.

CONCLUSIONS: Despite improvements, significant future opportunities exist. Chart forms are being revised; a collaborative strategy at the time of re-launch is recommended.

Dedication

To Pat, Beckie and Kristie for your ongoing support and belief in me.....

To my mother, who always encouraged me to reach for the stars.....

To my many friends and colleagues, who cheered me along.....

I extend my heartfelt thanks.

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CHAPTER I

INTRODUCTION, PURPOSE & OBJECTIVES AND RATIONALE

1.0 Introduction

Cardiovascular disease (CVD) is the primary cause of death, disability and illness in North America (1,2,15, 48). Cardiovascular disease, which refers to all diseases of the circulatory system, consists of two major components: a) ischemic heart disease (IHD) including acute myocardial infarction (AMI) and angina and b) cerebrovascular disease, including stroke.

The significant burden of cardiovascular disease impacts society in both human and economic terms. CVD is responsible for more hospital discharges than any other disease in Canada (27). In 1996 cardiovascular disease accounted for more than one third (37%), of all deaths in Canada with ischemic heart disease, chiefly acute myocardial infarction, being responsible for 21% of those cardiovascular deaths (3, 48). A recent Canadian analysis (4) estimated the total cost of cardiovascular disease from a societal viewpoint. Direct costs included expenditures on hospital care, other institutions, physician services, other health professionals, drugs and research while indirect costs included the costs associated with lost productivity due to premature mortality or disability. The total cost of cardiovascular disease was $18.0 billion in 1994 (the lower and upper bounds were $14.1 and $20.4 billion), with direct and indirect cost components of $10.4 and $7.6 billion respectively.

The highest age-adjusted mortality rate in the country is for CVD at 226 per 100,000 population, followed by cancer mortality at 185 per 100,000. The CVD mortality rate has been declining since the mid-1960s, likely due in part to decreases in smoking and dietary fat intake, increase in exercise and improved medical/surgical management. Although the absolute number of CVD deaths has increased only modestly (from 79,115 in 1995 to 79, 447 in 1996), when one considers the current and projected increasing numbers of elderly individuals in the population, the toll of CVD remains significant (27).

The Atlantic provinces have consistently experienced higher CVD mortality rates than the western provinces. For example, in 1996 the highest age-standardized mortality rate for cardiovascular disease in males was in Prince Edward Island at 365 per 100,000 while Newfoundland and Labrador experienced the highest rate in females at 225 per 100,000. Of note, the prevalence rates for smoking, high blood pressure and obesity run parallel to the provincial rates for cardiovascular disease (27). In a 1997 overview of provincial and territorial mortality indicators, Newfoundland and Labrador had the highest standardized rate for ischemic heart disease with 180 per 100,000 population, followed by Quebec with 141 per 100,000; the Canadian standardized mortality rate was 131 per 100,000 (27).

Due to the significant human and economic costs, to which Acute Myocardial Infarction (AMI) contributes significantly, numerous clinical trials have focused on

the diagnosis and management of AMI over the past several decades. These investigations began at approximately the same time as specialized coronary care units (CCUs) were being established in the 1970's. Fortunately, many medical therapies have been proven to be efficacious in reducing the burden of AMI (1). Such medical therapies consist of acute management strategies and preventive strategies. The focus of the current research is to examine one component of preventive care, that of in-hospital risk-factor management after AMI.

There has been considerable progress made in terms of the understanding of the vascular biology of atherosclerosis (5,13), the epidemiology of coronary artery disease (CAD)(2), the efficacy of numerous interventions which reduce coronary events (6,7,8,9) and the cost effectiveness of these interventions (10). The evidence has been considered compelling enough to result in the joint formulation of guidelines by the American Heart Association (AHA) and the American College of Cardiology (ACC). These guidelines support comprehensive risk reduction in patients with established vascular disease (11).

Patients with established coronary heart disease (CHD) are at the highest risk for recurrent coronary events, disability and death (5). In 1990 the risk of recurrent cardiac events in persons with established disease was reported as being increased by 10 fold.(14); that risk has likely been reduced due to improved

treatment strategies in the past decade. Patients with established coronary heart disease represent an easily identifiable high-risk population and there are effective strategies/tools to reduce risk. Therefore, modification and control of risk factors including lipid disorders (elevated levels of low density lipoprotein [LDL] cholesterol [LDL-C] and low levels of high density lipoprotein [HDL] cholesterol [HDL-C]), hypertension, cigarette smoking, and diabetes mellitus (DM) should be of priority in this population.

Secondary prevention refers to preventive measures for patients with established vascular disease (5,22,82) such as the post-AMI patients examined within this paper. These measures, or interventions, are designed to delay or prevent recurrent coronary events and cardiac death (5). In the current health care environment of cost-containment, preventive coronary care is best implemented using interventions that have been proven (11). Anticipated outcomes of such risk reduction include decreased cardiovascular and total mortality, decreased recurrent coronary events, decreased cardiovascular-related hospitalizations and improved quality of life for patients with CHD. There is considerable evidence that modification of cardiovascular risk factors either singly or in combination, is effective in reducing the number of clinical events in the secondary prevention of heart disease (5,7,8,9,12). An American College of Cardiology (ACC) conference specific to cardiovascular risk factors was held in Bethesda, Maryland in 1995. One of the primary conclusions of this 27th Bethesda Conference on " Matching

the Intensity of Risk Factor Management with the Hazard of Coronary Disease Events" (7) is that the cornerstone of optimal care is risk factor management.

The importance of risk factor management in patients with coronary heart disease has been well documented in the literature (5,7,8,9,12). However, for numerous potential reasons including: a) lack of education/insight of patients, physicians, health administrators and/or governments, b) negative attitudes toward a perceived self-inflicted or inevitable disease, c) perceived negative impact of lifestyle changes and d) focus on treatment versus prevention, the management of cardiovascular risk factors has been a source of controversy and actions to intervene on major risk factors have been limited (18,19).

Many potential barriers to the implementation of evidenced-based practice in secondary prevention of CHD have been identified (9,16,17,21) some of which include: lack of in-hospital time/organization for preventive care, slow uptake of treatment guidelines by physicians, lack of bridged communication to primary care family physicians and lack of communication to patients which leads to non-compliance. It may be that initiation and management of secondary prevention have not been assigned to any particular care-giver group, resulting in no well-defined plan for required long term follow up. One strategy or model for management that has been described includes a top down approach with a) the formulation and implementation of an "in hospital" risk reduction strategy, b) the

effective communication of that strategy to primary care physicians for ongoing follow up, c) implementation of a risk reduction strategy at the level of the primary care physician and d) patient compliance to a risk reduction strategy (16,17). Such an approach represents an opportunistic risk reduction strategy that captures patients hospitalized with an event. It must be noted, however, that from a societal perspective, other models designed to capture the majority of high-risk patients within the community should be considered. More than one approach is necessary to successfully impact secondary prevention of CHD.

The hospitalization period for acute coronary syndrome (ACS), including acute myocardial infarction (AMI), represents a unique window of opportunity for the first step toward a risk reduction strategy, the identification of risk factors. Once identified and documented, the process of developing a tailored risk reduction strategy is possible. This study will focus on the AMI hospitalization period to gain insights into cardiovascular risk factor identification, documentation and management. Specifically, this study will examine the impact of an in-hospital cardiovascular risk management strategy at the General Hospital, Health Sciences Center (GHHSC) in St. John's, Newfoundland.

1.1 Statement of the Problem

In two separate and previous reviews of AMI patients at the GHHSC (one

performed in 1998 by the cardiology nursing staff and one performed in 1999 by the researcher) it was evident that risk factor identification, documentation and management in this high-risk population were not satisfactory. Based on findings from the 1998 review, cardiology staff implemented a two part risk reduction strategy which included a) a lipid profile measurement within the first 24 hours after admission for AMI and b) utilization of three chart forms, *i) Cardiovascular Risk Factor Profile ii) Risk Factor Management Plan and iii) Cardiac Education Record (appendices G,H,I).*

The current study is important for several reasons. First, it will establish the current level of risk factor management at the GHHSC. Second, it will establish whether the risk reduction strategy implemented in December 1998 has been effective. Third, it has been established that audit and feedback of practice pattern behaviour relevant to the treating physician (i.e. his/her own data) are interventions that are moderately effective to change behavior (20). Although the data within this research are not identified so that individual physicians will receive feedback on their own practice patterns, the plan to share the findings with all cardiology staff could have a beneficial effect for future risk factor management. Fourth, this study will determine whether a hospital-based, cardiology divisional strategy can affect change and improve the in-hospital identification, documentation and management of cardiovascular risk factors. Lastly, this study will provide information pertaining to the perceived roles and

responsibilities of cardiology staff in terms of risk management of post-AMI hospitalized patients.

1.2 Purpose and Objectives

The purpose of this study was to review cardiovascular risk factor identification, documentation and management in the high risk AMI population at the GHHSC in St. John's, Newfoundland before and after the implementation of a cardiology divisional "in-hospital" risk management strategy and to assess its effect.

The following objectives were examined in the study:

1) To determine whether an in-hospital risk management strategy was effective in terms of increasing risk factor **identification and documentation.**

2) To determine whether an in-hospital risk management strategy was effective in terms of increasing in-hospital risk factor **management or management planning.**

3) To determine whether there is **clarity** in terms of roles and responsibilities for in-hospital risk factor management among cardiology staff including cardiologists, nurses, and dieticians.

1.3 Rationale

It has been established that management of cardiovascular risk factors is fundamental to optimal care of patients with coronary heart disease (5,6,7,8,9) and that the period of hospitalization for acute myocardial infarction offers a unique window of opportunity to identify risk factors and implement a risk reduction strategy (21).

In any strategy to improve management of risk factors the obvious first step is that of identification of the risk factors. In the hospital environment, it is important that identified risk factors are documented in the chart/medical record.

This research will examine chart documentation of cardiovascular risk factors and their management to determine whether an in-hospital cardiovascular risk factor management strategy was effective in improving assessment and documentation of risk factors and their associated management.

CHAPTER 2

BACKGROUND TO THE STUDY AND LITERATURE REVIEW

2.0 Background to the study and literature review

In a previous 1999 chart review completed by the researcher in AMI patients at the GHHSC, it became evident that lack of documentation of risk factors was frequent. When abstracting for risk factors within the hospital record, the question persisted: if there is no documentation of a risk factor, does that mean that there is no risk factor? Clearly that could be a very dangerous assumption. Complete, accurate and timely documentation is an essential part of the practice of medicine. Improved documentation may improve continuity of care for current and subsequent hospitalizations and improve the accuracy of record information used for quality measurement systems (24, 25). It seems reasonable that before a strategy to manage risk factors can be implemented in the hospital setting, some process to ensure accurate and complete documentation of risk factors is required.

2.1 Cardiovascular risk factors

Secondary prevention measures have been widely researched and discussed in the literature. Cardiovascular risk factor management provided by a team of cardiovascular specialists including physicians, nurses, dieticians, and perhaps others such as behavioral therapists, is considered optimal (7). Despite evidence for the efficacy of secondary prevention strategies, they are frequently

underutilized (36,37) and adherence over the long term, when implemented, remains low (37, 38).

The National Cholesterol Education Program (NCEP) Adult Treatment Panel II, which is an expert panel established in the US by the National Heart, Lung and Blood Institute (NHLBI) (46) defines positive cardiovascular risk factors as:

Non-modifiable

- Age (male ≥ 45 yrs, female ≥ 55 yrs or premature menopause without estrogen replacement therapy).
- Family history of premature CHD (definite MI or sudden death before 55 yrs in father or other first degree male relative or before 65 yrs in mother or other first degree female relative)

Modifiable

- Current cigarette smoking
- Hypertension
- Diabetes
- Dyslipidemia

Sedentary lifestyle and stress have also been identified as contributors to cardiovascular risk (47).

2.1.1 Modifiable cardiovascular risk factors

2.1.2 Smoking

Current cigarette smoking is defined as smoking one or more cigarettes per day (73). The 27th Bethesda Conference Task Force, based on observational studies that are considered conclusive, suggests that cigarette smoking increases the risk for cardiovascular disease (7). An average smoker dies three years earlier than a nonsmoker, while an individual known to be at high risk for cardiovascular disease dies 10-15 years earlier if he/she smokes (60,61). Smoking actually intensifies the effects of other risk factors, thus accelerating the progression of atherosclerosis and influencing occurrence of acute cardiovascular events (62).

Smoking cessation, although surprisingly not systematically evaluated in patients with heart disease, has been noted to result in as much as a 50% decrease in mortality (37,39,40). Much of the benefit of smoking cessation occurs within the first several weeks to months, but further reduction in cardiovascular mortality accrues as a late benefit. Risk of cardiovascular mortality is thought to assume that of a non-smoker after several years of non-smoking (7,87).

2.1.3 Hypertension

Hypertension is a cardiovascular risk factor that can lead to heart attack, stroke, heart failure, kidney damage and death (52). Numerous clinical trials and meta

analyses, involving thousands of patients, have shown that treatment of hypertension can decrease risk for these events (53,54,55.56). The sixth report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (JNC6), which includes a committee of experts established by the US National Heart, Lung and Blood Institute (NHLBI), defines hypertension as systolic blood pressure of 140 mm Hg or greater, diastolic blood pressure of 90 mm Hg or greater, or the use of an anti-hypertensive agent (53).

The goals of treatment for hypertension include:

- Prevention of morbidity and mortality from cardiovascular events (53).
- Blood pressure less than 140/90 (52,53)
    - Blood pressure less than 130/80 for diabetics (52).
    - Blood pressure of 130/80 or less for patients with non-diabetic renal disease (52).
    - Blood pressure less than 125/75 for renal disease patients with proteinuria greater than 1g/day (52).

2.1.4 Diabetes

It is estimated that diabetes, a major risk factor for CVD, affects approximately two million Canadians (57). Cardiovascular disease is the cause of 75-80% of hospitalizations and of deaths in the diabetic population (58). The presence of

diabetes has been shown to result in a two to three fold risk for cardiovascular disease (32,33,34). In a recent study, Lundberg et al. (35) investigated diabetes as a risk factor for AMI from a population perspective in Northern Sweden. The study included a representative sample of 2432 men and women between the years of 1990 – 1994 and a post-AMI population of 3031 patients between 1989 – 1993. The overall mortality rate post-AMI was four times greater in men and seven times greater in women, in the diabetic vs. non-diabetic population. The authors concluded that diabetes increases the risk of AMI.

A recent large study, the *Impact of Diabetes on Long Term Prognosis in Patients With Unstable Angina and Non-Q-Wave MI* (75) prospectively gathered data from 8013 patients in six countries to determine the two year prognosis for diabetic and non-diabetic patients who were hospitalized with unstable angina or non-Q-wave AMI. Another study, the *Mortality From Coronary Heart Disease in Patients With Type 2 Diabetes and in Non-Diabetic Subjects With and Without Prior MI* (74) compared the seven year incidence of AMI among 1373 non-diabetic and 1059 diabetic patients, all from a Finnish population based study. Both studies concluded that diabetic patients without previous vascular disease have as high a risk of developing vascular disease, such as AMI, as non-diabetic patients with pre-existing vascular disease. These data have stimulated discussions as to whether diabetic patients should be treated as aggressively as secondary prevention patients who have had a previous AMI.

The Diabetes Control and Complications Trial (DCCT) (59) examined whether intensive glucose control could decrease the frequency and severity of diabetic complications. A total of 1441 patients with insulin-dependant diabetes mellitus (IDDM) were included in the study which determined that intensive therapy to control glucose levels delayed the onset and slowed the progression of diabetic retinopathy, nephropathy and neuropathy in patients with IDDM. Similarly, the *United Kingdom Prospective Diabetes Study (UKPDS)* (76), prospectively examined 3867 newly diagnosed type 2 diabetic patients. The study reported that improved glucose control prevented the microvascular complications of insulin dependant diabetes mellitus (IDDM), such as retinopathy, nephropathy and neuropathy. However, tight glucose control was not shown to significantly reduce macrovascular complications including cardiovascular outcomes such as AMI and CV mortality, reinforcing the need for aggressive cardiovascular risk factor management in diabetics.

In terms of normalizing glucose levels, the 1998 Canadian guidelines (57) provide a system for classification of varying levels of fasting glucose and glycated hemoglobin (HBA1c). This system is shown in Table 2.1.

Table 2.1: Levels of Glucose Control for Adults and Adolescents with Diabetes Mellitus*

Glucose Parameter	Level			
	Ideal (normal nondiabetic)	Optimal (target goal)	Suboptimal (action may be required)	Inadequate (action required)
Glycated Hemoglobin - HbA_{1c}	0.04-0.06	< 0.07	0.07-0.084	>0.084
Fasting or premeal glucose level (mmol/L)	3.8-6.1	4.0-7.0	7.1-10.0	>10.0
Glucose level 1-2 h after meal (mmol/L)	4.4-7.0	5.0-11.0	11.1-14.0	>14.0

*(adapted from reference #57)

Diabetes remains a risk factor for poor outcomes in patients with established coronary artery disease (7). Haffner et al. (74) showed that the seven-year rate of major cardiovascular events for diabetics with previous myocardial infarction was similar to that reported for diabetics in the Scandinavian Simvastatin Survival Study (4S), at 45%; this compared to a rate of 18.8% in non-diabetics with prior myocardial infarction. The 4S study (42) was a landmark trial designed to evaluate the effect of lipid lowering therapy in 4444 patients with coronary heart disease. A post hoc subgroup analysis (83) was carried out on 202 diabetic patients and 4,242 non-diabetic patients. The authors concluded that the

absolute clinical benefit of lipid lowering in this high-risk population may be greater in diabetics versus non-diabetics due to their absolute increased risk for recurrent events. Similar to other trials (77,78), diabetics in the 4S study and the study by Haffner et al. also had a much higher rate of mortality from CHD than non-diabetics.

A recent study by The Heart Outcomes Prevention Evaluation (HOPE) study investigators titled, *Effects of an Angiotensin Converting Enzyme Inhibitor, Ramipril, on Cardiovascular Events in High Risk Patients,* (81) measured outcomes including death, myocardial infarction and stroke in a broad range of high-risk patients from almost 300 centers in North America, Europe, Argentina and Brazil who did not have heart failure or low ejection fractions (conditions normally requiring treatment with an angiotensin converting enzyme inhibitor, such as Ramipril). Inclusion criteria for the HOPE trial were, men and women who were at least 55 years of age with a history of: CAD, stroke, peripheral vascular disease, or diabetes plus at least one other cardiovascular risk factor. There were a total of 9297 patients included in the study, 3577 had diabetes. The incidence of composite outcomes (MI, stroke or death due to cardiovascular causes),in the diabetic population was19.8%, which is much lower than the 45% rate reported in the two previous trials. This rate of events was not significantly different from the rate of 16.5% seen in non-diabetic HOPE patients, suggesting less risk for diabetics than previously reported. However, of the 3577 diabetics,

1135 of them had no clinical manifestation of cardiovascular disease. Their rate of events was nearly half that of the group with clinical manifestations (10.2 % vs. 18.7%), supporting the hypothesis of increased risk if patients have both established CVD (such as the post AMI populations of the Haffner and 4S trials) and diabetes.

In summary, numerous trials suggest that attention to cardiovascular risk factor management and optimal control of diabetes (i.e. tight glucose control) are extremely important in diabetic patients with established coronary artery disease.

2.1.5 Dyslipidemia

Dyslipidemia is the term generally accepted to describe an abnormal lipid profile. Elevated LDL-C and decreased HDL-C are considered major risk factors for cardiovascular disease. Hypertriglyceridemia is associated with compositional changes in LDL-C resulting in smaller and more dense particles which are more susceptible to oxidation and thus believed to be particularly atherogenic (7). The relationship between triglycerides and coronary heart disease has been difficult to elucidate and to date remains controversial. Clinical trials have not demonstrated the benefit of triglyceride lowering, however, observational studies have suggested triglyceride elevation as a risk factor in subsets of patients, especially those with low HDL cholesterol. (63,64,84).

Management of hyperlipidemia in the secondary prevention of heart disease has been proven to decrease the risk for morbidity and mortality (7). Over the past decade large landmark clinical trials such as the previously discussed Scandinavian Simvastatin Survival Study (4S), the Cholesterol And Recurrent Events trial (CARE) (85) and the Long Term Intervention with Pravastatin in Ischemic Disease (LIPID)Trial (86), have demonstrated that statin drugs (Simvastatin and Pravastatin respectively), initiated three to six months after AMI, significantly reduce morbidity and mortality in patients with established coronary artery disease, probably by reducing the risk for plaque rupture by stabilizing vulnerable plaques (37, 41, 42).

The CARE trial (85) was a five-year double blind placebo controlled trial, designed to examine the effect of lowering cholesterol in patients with coronary artery disease who had average cholesterol levels, rather than elevated levels. There were 4159 men and women included in the study which demonstrated that the benefit of cholesterol lowering extends to patients with coronary artery disease who have average levels; this group of patients represents the majority of patients with coronary artery disease. The findings of this trial allowed the benefits of lipid lowering to be expanded to a very large population of high-risk patient. The LIPID trial (86) was also a double blind placebo controlled trial. It examined 9014 patients who were followed for six years and it determined that there were statistically significant mortality and morbidity benefits in patients with

AMI or unstable angina who had a broad range of initial cholesterol levels.

In April 2001, results of the MIRACLE Study, Effects of Atorvastatin on Early Recurrent Ischemic Events in Acute Coronary Syndromes, were reported (89). This randomized, placebo controlled trial included 3086 adults ages 18 years or older and examined early intervention with a statin in patients with acute unstable angina or non-Q-wave AMI. This trial was of sixteen weeks duration and the results demonstrated benefit, in terms of reduced recurrent symptomatic ischemic events requiring emergency re-hospitalization ($p=0.02$), within a 16 week time-period.

In summary, many thousands of patients, in many countries, have been examined in large, randomized, placebo-controlled trials, which have consistently concluded morbidity and mortality benefits in high-risk patients with established CAD who received statin therapy to manage their lipid levels.

Table 2.2 illustrates target lipid levels for patients, depending on their predicted degree of risk over the next ten years as well as presence of diabetes or CVD. Patients with established CVD, such as those examined in this research, are considered very high risk.

Table 2.2: Target Lipid Values by Level of Risk*

Level of risk (definition)	LDL-C level, mmol/L	Total cholesterol: HDL-C ratio	Triglyceride level, mmol/L
Very high (10-yr risk of CAD >30%, or history of CVD or diabetes)	<2.5	<4	<2.0
High (10-yr risk 20-30%)	<3.0	<5	<2.0
Moderate (10-yr risk 10-20%)	<4.0	<6	<2.0
Low (10-yr risk <10%)	<5.0	<7	<3.0

*(Adapted from reference #66)

2.1.6 Sedentary lifestyle

Exercise education is considered a key service of any comprehensive cardiac rehabilitation program (44).

It is difficult to measure physical activity and quantify the relationship between the amount of exercise and the risk of coronary heart disease. However, over 50 studies have established that physical activity reduces the risk of coronary artery disease events (7,40,65). Some examples of research results on the topic of sedentary lifestyle are seen in a population based cohort study performed in Norway, where 5220 men and 5869 women aged 20 to 49 years at the time of entry were surveyed at two time periods (1979 – 1980 and 1986 – 1987). Self

reported leisure time activity, as well as body mass index (BMI) and lipid levels were assessed. The authors concluded that sustained high levels of activity and change from sedentary to higher levels of physical activity resulted BMI and lipid parameter benefits to both men and women (88). Similarly, 7735 men aged 40-59 years in Britain were studied to assess the relationship between physical activity and changes in activity, all cause mortality, and the incidence of major coronary heart disease. The study determined that maintaining or beginning light or moderate physical activity reduced mortality and AMI in men with and without clinical evidence of cardiovascular disease (51).

Modification of risk factors, either singly or in combination, in the population with established coronary artery disease is considered a powerful method of reducing the risk of morbidity and mortality, comparable for instance, to such interventions as bypass surgery (45).

2.2 In-hospital risk reduction strategies

The current focus of hospitalization in the post AMI period is largely one of treatment rather than prevention, although it has been suggested that in-hospital management of cardiovascular risk factors in the AMI patient may be the ideal place to begin. The Joint European Task Force recommendations state that the hospital is a good starting point for a rehabilitation program and that this program

needs to be bridged to the community to provide continuity of risk factor management (21). During the acute in-hospital phase, patients may be preoccupied and their degree of receptiveness to education programs is not fully understood. However, surveys such as HELP (Heart European Leaders Panel) have shown that patients listen to the advice that hospitals provide. That insight suggests there is good reason for treating cardiologists to ensure patients leave hospital with appropriate advice and treatments that are optimally followed up by primary care (16,17,28). It has been suggested that the lack of urgency to initiate in-hospital risk factor management planning signals to primary care physicians that it is less than high priority. Furthermore, a delay in communicating often means the impetus to initiate a follow up plan is lost (16,26).

Recognizing that reasons for lack of optimal attention to cardiovascular risk factors are likely multifactorial, one suggestion has been that hospitals are often not organized well enough to provide preventive care (16,17). Perhaps preventive care has not been seen as part of the hospital mandate, leaving the major focus on treatment versus prevention. The emphasis on early discharge means there is limited opportunity for busy cardiologists to provide advice about the benefit of risk reduction. The focus of the hospitalization is not on risk factors, but the acute manifestation (16,17). Currently, work is ongoing to improve the process of risk identification, documentation and management in the acute hospitalization period. One example of such an initiative is ongoing in Nova

Scotia. A number of hospitals participating in the Improving Cardiovascular Outcomes in Nova Scotia (ICONS) project have developed various custom made standard chart forms, capturing risk factors and requiring a doctor's sign off pre-discharge; copies are then sent to primary care physicians. It may be that such interventions will improve management by ensuring treating physicians are aware of patients' risk factors, while also bridging to the community for long term management (31). Follow-up of this work is ongoing.

There is very little information available pertaining to the roles and responsibilities of various cardiology staff members including cardiologists, nurses and dieticians, in terms of cardiovascular risk factor identification, documentation and management. In the busy environment of acute hospital care, cardiology staff members have very limited time, which is often spent responding to acute lifesaving situations. Although not acutely a priority, management of risk factors today may avoid such life saving crises in the future. A process which facilitates attention to risk factors that is understood by all cardiology staff should allow for a more efficient method of establishing a risk reduction strategy for each AMI patient pre-discharge, one that is communicated to primary care, to allow for long term follow up and management. This process requires further research.

2.2.1 In-hospital lipid lowering treatment

Many hospitals have initiated routine standing orders to measure lipid profiles

within 24 - 48 hours of AMI in an attempt to identify high-risk patients needing aggressive lipid management and to intervene early (31,50); this practice is not without some debate. The NCEP treatment guidelines, for example, have recommended delaying baseline lipid measurement until six weeks post acute event, recognizing that the acute-phase response triggered by AMI can potentially lower total and LDL cholesterol (46). Such delay means the time to intervene occurs after leaving hospital, when the patient may be less focused on the importance of the issue and in a setting of lesser resources (48).

Lipid profiles obtained within the first 24-48 hours of admission for AMI in a number of studies (49, 80) have demonstrated consistency when compared to steady state levels at two to three months post-discharge, thus removing some of the perceived barriers to early intervention. However, it must be recognized that if the lipid profile is obtained after 48 hours of the event, the results can be misleading. Examples of two studies that reported on the timing of lipid profile measurement post–AMI include 1) *Plasma lipids: when to measure after myocardial infarction?* (80) and 2) *Clinical utility of lipid and lipoprotein levels during hospitalization for acute myocardial infarction.* (49). The former study examined plasma lipids in 132 post AMI patients on admission and 24, 48 and 72 hours later; 103 of these patients also had lipid measurements at three months. The latter study examined in-hospital lipid levels (within 48 hrs versus after 48 hours) compared to post discharge levels (2-3 months post discharge) in 294

patients at the Brigham and Women's Hospital in Boston. Both studies concluded that lipid profiles should be measured within 48 hours of admission for AMI.

The decision of when to manage lipids after AMI becomes a choice between early intervention with follow up by the treating cardiologist, or later intervention with follow up by the treating cardiologist or family physician. Without communication between the specialist and primary care family physician, the opportunity to intervene may be missed.

A university hospital program in California, Cardiac Hospitalization Atherosclerosis Management Program (CHAMP), that focused on initiating lipid lowering treatment in AMI patients before discharge, preliminarily reported a significant increase in treatment rates, improved patient compliance and an increased number of patients reaching target LDL levels (50). Very recently, in April 2001, CHAMP reported improved utilization of evidence- based therapies post-AMI (Aspirin, Beta Blockers, Nitrates, Angiotensin Converting Enzyme Inhibitors and Statins) optimized through the use of an in-hospital treatment algorithm strategy. This increased utilization of proven therapies was associated with significantly improved clinical outcomes in the year after discharge including decreases in rates for recurrent AMI, heart failure, hospitalization, sudden death, cardiac mortality, non-cardiac mortality and total mortality (79).

On a broader, population scale, a team of Swedish investigators completed a prospective cohort study using data from the Swedish Register of Cardiac Intensive Care on patients admitted to coronary care units of 58 Swedish hospitals between 1995 and 1998. They obtained one-year mortality data from the Swedish National Cause of Death Register. It was concluded that early treatment with a statin (at or before hospital discharge) in patients with AMI is associated with reduced one-year mortality. At one year, unadjusted mortality was 9.3% (1307 deaths) in the no-statin group versus 4.0% (219 deaths) in the statin treated group. This reduction in mortality was similar among all subgroups based on age, sex, baseline characteristics, previous disease and medications (67).

In a recent correspondence to Lancet, Missouris and MacGregor (30) described findings pertaining to in-hospital lipid management post AMI. In a 1996 CCU chart audit at St. George's Hospital in London, UK it was identified that only 13% of post AMI patients were discharged on a statin drug despite an 89% rate of lipid measurement due to CCU admission protocol. By empowering CCU nurses to constantly remind medical staff to start a statin when indicated, before discharge, a follow up audit in 1998 showed that more than 68% of patients were discharged on a statin drug. This simple maneuver of empowering nurses provided the extra push required to achieve improved lipid management.

2.3 Chart non-documentation

During chart abstraction for the current research, there were frequent occurrences when no mention was made of cardiovascular risk factors.

Quality of medical care is frequently assessed by measures of structure, process and outcomes of care (69). Although critical indicators of care, outcome measures may take years to develop and certain endpoints occur only rarely. For instance, acute coronary syndromes, stroke and death are rare long-term outcome consequences of hyperlipidemia. They are not useful endpoint measures for short-term trials assessing cardiovascular care; on the other hand, processes of care, such as completeness of history and physical chart documentation, appropriateness of therapeutic care and follow-up can be assessed immediately. These measures of care process are only meaningful if they can be linked with outcomes (70). Investigation of this link requires further research.

It seems reasonable to expect that data pertaining to cardiovascular risk factors would be easily obtained from the patient chart. The chart is the ultimate information source for many purposes including: to recall observations, to inform others, to instruct students, to gain knowledge, to monitor performance and to justify interventions. Patient care planning for the short and long term should be

evidenced within the chart (72).

Recently investigators from the ICONS project presented an abstract at the 1999 Canadian Cardiovascular Society (CCS) annual meeting, which identified lack of documentation of cardiovascular risk factors in the hospital charts of cardiovascular patients in Nova Scotia (23). Specifically, in the AMI population, (at the time of this abstract 1187 patients had been included for analysis) smoking status was not documented in 6% (n=71), diabetes status in 24% (n=285), cholesterol status in 27% (n=320), hypertension status in 19% (n=226) and presence of family history in 59% (n=700) of cases. Another study, a *British Cardiac Society survey of the potential for secondary prevention of coronary disease, ASPIRE (Action on Secondary Prevention through Intervention to Reduce Events)* (22) found that recording and management of risk factors including lifestyle, blood pressure, cholesterol, and glucose were less than optimal in hospital records. The authors concluded that a more structured approach, or process, is needed to ensure the identification and management of risk factors. Secondary prevention measures should begin as soon as the diagnosis is made, and shouldn't be postponed until the patient deteriorates to the point of needing bypass surgery.

A team of researchers in Illinois investigating whether a computer-based patient record (CPR) affects the completeness of documentation and appropriateness of

documented clinical decisions found that with more complete documentation, more appropriate clinical decisions were made, as judged by an expert panel. Four blinded expert reviewers evaluated 50 progress notes of patients with chronic diseases and whose physicians used either a CPR or paper record. The authors found that physicians who used the CPR vs. paper records, documented problem lists and medication lists more completely (1.79/2.00 vs. 0.93/2.00, $p<0.001$), provided more evidence in their documented assessment that they had considered relevant factors in their decision-making (1.53/2.00 vs. 1.07/2.00, $p<0.001$) and they documented more appropriate decisions (3.63/5.00 vs. 2.50/5.00, $p<0.001$). The authors argue that improvement in documentation is improvement in practice (72). Further research is needed to determine whether improved practice translates into improved clinical outcomes.

One example of the implementation of chart forms to improve the process of in-hospital education was published in 1998. The authors described the need to improve the process of education delivery in an environment of inadequate patient knowledge and goal setting as well as decreasing length of stay at their hospital in New Jersey, USA. The patient hospital charts were reconfigured to include a central location for patient education documentation forms. A review of almost 900 patient charts revealed an increase in documentation rate from 41% in the summer of 1995 to 93% in the fall of 1996. All pertinent disciplines were involved in decision making throughout the process of development and

implementation of this continuous quality improvement (CQI) initiative (29).

2.4 Summary

Review of the literature demonstrates unequivocal benefit of management of modifiable cardiovascular risk factors, including cigarette smoking, hypertension, diabetes, dyslipidemia and sedentary lifestyle. Despite evidence that reduction of these cardiovascular risk factors positively impacts morbidity and mortality in patients with established coronary artery disease, the current management of these risk factors is less than optimal.

Patients with AMI are at increased risk for progression of disease and recurrent events. Many trials have identified interventions such as smoking cessation, hypertension management, lipid management and exercise regimens, as tools to reduce risk in this high-risk population. The resulting combination includes a high-risk population and proven interventions for benefit. This should underscore the need to ensure management of cardiovascular risk factors in AMI patients as a priority.

The issue of when and where a cardiovascular risk reduction strategy should begin has been examined. One model presented is an in-hospital post AMI strategy, which represents an opportunistic top down approach. It is recognized

that this is one of many potential models with the limitation of capturing only those patients admitted to hospital with an acute event. However, it may be that hospital is the ideal place to begin a risk management plan that is bridged to the community primary care physician for long-term follow-up and management. Other models, capturing the majority of high-risk patients in the community, are important and warrant further investigation.

The patient's hospital chart is the ultimate source of information that is used for numerous purposes, including patient management planning. Although not widely discussed in the literature, it is intuitive that quality of chart documentation will lead to quality patient care delivery. The current research will assess whether an in-hospital cardiovascular risk reduction strategy improved documentation of cardiovascular risk factors and their management. Further research is needed to assess whether improved documentation leads to improved quality of care and outcomes.

CHAPTER 3

METHODS AND PROCEDURES

3.0 Methods and Procedures

Chapter three is a presentation of the methods and procedures of the study. For the purpose of presentation, the chapter has been divided into five sections: i) introduction ii) description of the populations iii) description of the research tools utilized iv) description of the procedures and v) description of data analyses.

3.1 Background for study methods

In December 1998, staff at the GHHSC initiated a two-part cardiovascular risk reduction strategy for post AMI patients. The strategy included 1) measurement of lipid profile within 24 hours of admission and 2) the addition of three chart forms *a) Cardiovascular Risk Factor Profile* (see appendix G), *b) Cardiovascular Risk Factor Management Plan* (see appendix H) *and c) Cardiac Education Record* (see appendix I). By measuring lipids within the first 24 hours of admission, elevated levels could be brought to the attention of treating cardiologists, nurses and dieticians, increasing the likelihood of lipid management. Completion of the three risk factor chart forms was an attempt to increase identification, documentation and management of risk factors. Completion of the chart forms was the responsibility of nursing/dietician staff and sign off by treating cardiologists was not necessary. The beneficial effect of the strategy could be limited due to lack of physician involvement. Cardiologists,

through completion of discharge summaries and letters, are the link to community primary care, making their involvement in risk management essential.

The routine standing order for lipid profile measurement was included on the CCU admission order form for AMI patients. The three chart forms were located on the cardiology floor and the nurse or dietician completing the forms was responsible to add the forms to the patient chart.

3.2 Description of the Populations:

The study populations for this research include post-AMI patients examined within the chart review portion (phase I) of the study and cardiology staff members included in the survey questionnaire portion (phase II).

3.2.1 Population for phase I:

The target population for this cross sectional descriptive study included all patients discharged from the GHHSC with a "most responsible discharge diagnosis" of Acute Myocardial Infarction, ICD 9 code 410. Charts of patients meeting that criterion for two separate time periods, before and after implementation of an in hospital cardiovascular risk management strategy in December 1998, were reviewed. In an effort to eliminate any affect of seasonality, the following complete year time periods were selected for

examination:

The before group: June 1, 1997 - May 31, 1998

The after group: June 1, 1999 - May 31, 2000

Time constraints did not permit review of all AMI patients. It was therefore decided that selection of those with a "most responsible discharge diagnosis" of AMI would answer the needs of this research. It is important, however, to note that this study will not examine patients who experienced AMI as a secondary diagnosis. Although an important group, deserving the same attention to cardiovascular risk management, it will not be included within the scope of this study.

Table 3.1 represents the population examined in phase I of the study:

Table 3.1 – Study populations in the before group and the after group:

27 In-hospital deaths *(18%)*	22 In-hospital deaths *(13%)*
8 excluded, 2 charts missing & 1 wrong coding Total 11 *(7%)*	14 excluded Total 14 *(8%)*

Table 3.2 lists reasons for exclusion from the study and details the numbers excluded in each group.

Table 3.2: Excluded patients:

Reasons for exclusion	Before group	After group
1) For palliative care only (No code 9 order on chart)	6	9
2) One day transfer patient (ie. for cath from another site)	1	4
3) Self-discharged within 48h	1	1
Total	8	14

3.2.2 Population for phase II:

The target population for this cross sectional descriptive study included full time and part time cardiology staff working currently, and for at least the past three months, on the cardiology floor at the GHHSC. Of the total nine cardiologists on staff at the GHHSC, one cardiologist did not have CCU/5SA (cardiology floor) responsibilities, making eight cardiologists available for inclusion. Of the 52 nurses on staff, two nurses were not available due to long term sick leave and seven were excluded due to having less than three months experience on the unit, leaving 43 nurses available for inclusion. There was one dietician on staff for inclusion. Table 3.3 details the distribution of survey questionnaires.

Table 3.3 Total number of survey questionnaires distributed :

Total number of survey questionnaires distributed:
52 *(100%)*
8 cardiologists *(15%)*
43 nurses *(83%)*
1 dietician *(2%)*

3.3 Description of research tools utilized:

Two research tools were developed specifically for this study. There were no formalized processes for validation of these forms; rather, local face validity was established as described below.

3.3.1 Post AMI CV Risk Management Chart Review Form (appendix C)

This Post AMI CV Risk Management Chart Review Form was utilized for chart data abstraction. Based on a previous pilot study performed by the researcher, the chart review form was revised to capture all necessary variables related to risk factor identification, documentation and management in-hospital. The revised chart review form was pre-tested on the first ten charts for both adequacy of abstraction and completion of data entry. After a second revision, the chart

review form was accepted.

3.3.2 Post AMI Risk Assessment Questionnaire (appendix D)

This Post AMI Risk Assessment Questionnaire was developed by the researcher and piloted by five ICU/CCU nurses. Following several revisions it was re-piloted with three different nurses and one physician. It was then adopted as adequate.

3.4 Description of procedures:

Procedures for phase I and phase II are detailed in this section.

3.4.1 Procedure for phase I:

Ethical considerations:

Ethical approval was obtained from the Human Investigation Committee (HIC) at Memorial University of Newfoundland (MUN) (appendix A) and the Research Proposals Approval Committee (RPAC) of the Health Care Corporation of St. John's (appendix B). Once ethics approval was confirmed, Ms. Ricki Fisher, Supervisor for research and statistics at the GHHSC, was consulted. Ms. Fisher generated the necessary lists of AMI patients for the required timeperiods.

For ethical and security reasons, no names were used on any abstraction forms; rather, they were numerically coded. All data were kept in a locked cupboard.

Chart retrieval and review:

All AMI patients at the GHHSC during the examined time periods with a discharge ICD 9 code 410 were identified. From that list, charts which had a 410 code listed as the "most responsible discharge diagnosis" were selected and sequenced by chart number for record retrieval by medical records staff. During the months of August through December 2000, the researcher independently reviewed charts and abstracted data.

Variables selected to assess identification and documentation of risk factors included: previous MI, previous CAD, family history of heart disease, hypertension, diabetes, cholesterol and current smoking status.

Documentation of a risk factor was considered present if it was recorded anywhere within the patient chart including the discharge summary, physician, nursing and/or dietician notes and lab slips. The presence of a risk factor was recorded as yes, no, unknown (patient unaware of status) or not documented. The yes, no and unknown results were defined as the "total documented" category, which was then compared to the "total non-documented" category.

Variables selected to determine management of risk included: evidence of lipid measurement in hospital or within past three months (up to three months was selected to accommodate ease of information retrieval), patient on lipid lowering

therapy at time of discharge (started either before or during hospitalization), documented follow-up lipid plan (i.e. note to check lipid profile in four to six weeks), follow-up smoking cessation plan (i.e. note to discuss with family physician or to try nicotine patch) evidence of stress counseling, smoking cessation counseling, diet counseling and exercise counseling. For this research, any attempt at counseling documented within the chart was considered counseling. For instance, if a physician mentioned to a patient that he should quit smoking, it was considered smoking cessation counseling.

Many factors could have been examined to determine predictability for cardiovascular risk factor identification, documentation and management. For this study, however, only age (younger versus older), sex (male versus female) and location of the patient (St John's and metro area, which for the purpose of this research will be referred to as Central Health Region (CHR), versus non-CHR) were examined with logistic regression analyses.

3.4.2 Procedure for phase II:

Ethical considerations:

In early October 2000, having all required ethics approval, discussions were held with Dr. Eric Stone, Chief, Division of Cardiology and Ms. Marie Duffett, Nurse Manager (Cardiology), to obtain permission to contact staff to participate in this research by completing survey questionnaires.

To ensure total anonymity, no names were required and all returned surveys were coded numerically. Survey response cards were dropped in separate envelopes when completed surveys were returned.

Survey distribution:

In October 2000 all cardiology staff received by internal mail, personally signed letters of introduction from the researcher and packages (see below) to facilitate completion of the Post AMI CV Risk Assessment Questionnaires.

The mail out packages included:

- *A cover letter of introduction* explaining the purpose of the questionnaire and the importance of cardiology staff input for analysis of the current status of risk management at the GHHSC. Instructions for completion of the survey questionnaire and drop off in clearly marked boxes at any of three sites located on the cardiology floor, the EKG Department or the Cardiac Catheterization Laboratory were described.

- *The Post AMI Risk Assessment Survey Questionnaire.*

- Although participation was voluntary and anonymous, survey response cards titled, *Confirmation of Survey Questionnaire Completion cards* were included in the package to be signed and dropped in separate envelopes

attached to each drop off box. This allowed the researcher to follow up on questionnaires that were not returned.

- For the information of staff being surveyed, copies of all three forms utilized in the December 1998 in-hospital CV risk management strategy were included.

(See appendices D,E,F,G,H,I, for complete mail out package).

Other efforts to optimize survey completion:

In November 2000, reminder letters (see appendix J) were sent by internal hospital distribution to individuals who had not completed and returned their surveys, as evidenced by absence of signed survey response cards.

At the same time as the reminder letters were sent, the researcher posted reminder signs on the cardiology floor asking for staff participation in survey completion. Additionally, survey questionnaire packages were made available at the January 2001 cardiology nurses staff meeting and lastly, personal contact was made with four remaining cardiologists to ask for their participation.

3.5 Description of data analyses

All data were analyzed using the Statistical Package for Social Sciences (SPSS - version 8). The phase I portion of the study required a comparison of the before and after groups in terms of identification, documentation and management of risk factors. For this, Chi-square analyses were utilized. The probability level needed for rejection of the null hypotheses, when the null hypothesis is true, was set at 0.05. Independent samples T-Test was used to compare average length of stay (LOS) information. Logistic regression analyses were conducted to identify independent variables associated with not implementing the risk management strategy.

Phase II of the study required an analysis of survey questionnaires. Frequency tables were used to analyze the survey responses, which are reported in aggregate for the entire survey population to ensure anonymity. Each questionnaire was reviewed by the researcher to capture data from the additional comments sections, which are summarized in the results section of this paper.

CHAPTER 4

RESULTS

4.0 Results

Following a review of demographic findings, this chapter has been divided into three major sections, corresponding to the two objectives relating to the effect of the in-hospital risk management strategy utilizing chart reviews in phase I and the one objective relating to staff perceptions utilizing survey questionnaires in phase II.

4.1 Phase I demographic findings

A total of 324 charts were identified as having a "most responsible discharge diagnosis" of AMI. Of those, there were 49 in-hospital deaths and 25 charts were excluded (see table 3.1). Information was therefore collected on a total of 250 patients; 114 in the before group and 136 in the after group. The before group median age was 60 years (range 32 – 87 years) and the after group median age was 67 years (range 24 – 90 years). Since no age restriction was applied to the in-hospital risk management strategy, no age exclusion was applied for this study.

One analysis considers age in two categories, a) less than or equal to 70 years and b) older than 70 years. There was a significant increase in the proportion of elderly AMI patients from 25% in the before group to 42% in the after group

($p < 0.006$). As well, the female proportion of the AMI population increased from 31% before to 35% after (not statistically significant). The GHHSC is the tertiary center for Newfoundland and Labrador, thus the primary referral center for the province. There was no significant increase in the number of patients hospitalized at this center from outside the St. John's and metro area (Central Health Region - CHR). The number of patients from other than the CHR in the before group was 22% vs 25% in the after group. (See table 4.1)

Table 4.1 Characteristics of patients in phase I analysis

		Before Group n(%) 114(100)	After Group n(%) 136(100)	Statistical significance p Value (Δ before/after)
Age	≤ 70 yrs	85(75)	79(58)	
	> 70 yrs	29(25)	57(42)	**0.006***
Sex	Male	79(69)	89(65)	
	Female	35(31)	47(35)	0.518
Location	CHR †	90(78)	102(75)	
	Other than CHR	24(22)	34(25)	0.461

* Chi-Square statistical significance if $p < 0.05$

† CHR = For the purpose of this research, Central Health Region includes St. John's and metro area, Other than CHR = all other regions within the province of Newfoundland and Labrador.

The in-hospital AMI mortality rate at the GHHSC decreased over the time span of this research. The in-hospital mortality for the study population, (AMI "most responsible discharge diagnosis") decreased from 18% to 13%. Length of stay (LOS) decreased somewhat over the time period of this research. The average LOS in the before group was 8.8 days versus that of the after group at 8.4 days. Neither decreases in mortality or LOS reached statistical significance (See table 4.2).

Table 4.2 Mortality and average length of stay findings for study population

	Before Group n*(%)* 114*(100)*	After Group n*(%)* 136*(100)*	P value (Δ before/after)
Deaths	*27(18)*	*22(13)*	0.136
Length of stay	8.8 Days	8.4 Days	0.625

Chi-square statistical significance if $p < 0.05$

4. 2 Results pertaining to phase I:

4.2.1 Before/after analyses pertaining to identification and chart documentation:

Of the variables selected to determine identification and documentation of cardiovascular risk factors including previous MI, previous CAD, positive family history, hypertension, diabetes, elevated cholesterol and current smoking status,

only one variable, documentation of previous CAD, reached a level of statistical significance in the after group ($p = 0.049$). Documentation of previous MI and cholesterol status showed a positive trend, otherwise charted variables were largely unchanged (see table 4.3).

Table 4.3 Cardiovascular risk factor documentation comparison between groups, for total documented versus total not documented:

Risk Factor		Before Group n(%) 114(100)	After Group n(%) 136(100)	P Value (Δ before/after)
Previous MI	Yes	28(25)	38(28)	
	No	48(42)	65(48)	
	Unknown	0(0)	0(0)	
	Total doc	76(67)	103(76)	
	Not doc	38(33)	33(24)	0.113
Previous CAD	Yes	42(37)	58(43)	
	No	43(38)	57(42)	
	Unknown	0(0)	0(0)	
	Total doc	85(75)	115(85)	
	Not doc	29(25)	21(15)	**0.049***
Positive family history	Yes	60(53)	76(56)	
	No	28(25)	26(19)	
	Unknown	2(2)	0 (2)	
	Total doc	89(80)	103(77)	
	Not doc	25(20)	33(23)	0.575
Hypertension	Yes	42(37)	61(45)	
	No	49(43)	49(36)	
	Unknown	0(0)	0(0)	
	Total Doc	91(80)	110(81)	
	Not Doc	23(20)	26(19)	0.834
Diabetes	Yes	31(27)	29(21)	
	No	58(51)	73(54)	
	Unknown	0(0)	0(0)	
	Total Doc	89(78)	102(75)	
	Not Doc	25(22)	34(25)	0.569
Elevated Cholesterol	Yes	28(25)	43(32)	
	No	16(14)	26(19)	
	Unknown	39(34)	36(27)	
	Total Doc	83(73)	105(78)	
	Not Doc	31(27)	31(22)	0.422
Current smoker	Yes	48(42)	53(39)	
	No	51(45)	67(49)	
	Unknown	0(0)	0(0)	
	Total Doc	99(87)	120(88)	
	Not Doc	15(13)	16(12)	0.739

* Chi-square statistical significance if p< 0.05

4.2.2 Before/after analyses for in-hospital cardiovascular risk management:

Variables selected to determine management of risk factors included: measurement of lipid status in hospital or within three months prior to hospitalization, presence of lipid lowering therapy (LLT) at discharge (unless reported values were within recommended levels), dietary counseling, stress management counseling, exercise counseling, smoking cessation counseling (if identified as a smoker), documented plan for follow up of lipid status and documented plan for smoking cessation follow-up.

Attention to lipids, including measurement of lipids and percent of patients on lipid lowering therapy at discharge were both statistically significantly increased in the after group compared to the before group (64.0% vs 20.0% and 31.0% vs 11.5% respectively at the $p < 0.001$ level in both cases). Smoking cessation counseling increased significantly from 24.0% to 48.0% in the after group ($p < 0.001$) while stress management counseling increased from 4.0% to 21.0% in the after group ($p < 0.001$). However the numbers of patients with documented counseling for smoking cessation and stress management were quite small, ranging from a low of five in the before group for stress counseling to thirty three in the after group for smoking counseling. In terms of a documented plan for lipid follow-up and documented plan for smoking cessation follow-up there were no differences in the before and after groups. The results for non-documentation of dietary and exercise counseling showed significant differences, however,

contrary to intuition, both demonstrated increased documentation in the before group vs after (11.5% v.s.28.0% and 20.0% v.s.32.0% respectively $p < 0.001$ in both cases) (see table 4.4).

Table 4.4 Comparison of documented cardiovascular risk factor management:

		Before Group n(%) 114(100)	After Group n(%) 136(100)	P value (Δ before/after)
Lipid measure	Yes	23(20)	87(64)	**< 0.001***
	No	91(80)	49(36)	
On LLT at discharge	Yes	13(11.5)	42(31)	**< 0.001***
	No	101(88.5)	94(69)	
Stress counseling	Yes	5(4)	28(21)	**< 0.001***
	No	109(96)	108(79)	
Smoking counseling	Yes	15(24)	33(48)	**< 0.001***
	No	48(76)	36(52)	
F/U Lipid plan	Yes	35(31)	31(23)	0.470
	No	79(69)	105(77)	
F/U Smoking cessation plan if applicable	Yes	4(5)	3(5)	0.937
	No	59(95)	66(95)	
Diet counseling	Yes	101(88.5)	98(72)	**< 0.001 †**
	No	13(11.5)	38(28)	
Exercise counseling	Yes	91(80)	92(68)	**<0.030 †**
	No	23(20)	44(32)	

* Chi-square statistical significance if $p < 0.05$

† Chi-square statistical significance in favor of the before group

4.2.3 Predictors of risk factor management

Logistic regression analyses were completed to determine whether 1) age (≤ 70 yrs vs. >70 yrs), 2) sex or 3) location (Central Health Region (CHR) vs. non CHR) were predictive of effective management strategies including: measurement of lipids, treatment with lipid lowering therapy (LLT) at discharge, completion of the two CV risk factor forms and completion of the cardiac education form. Although many variables could have been included in these analyses, these three were included, particularly to assess any age or gender bias, which has been discussed extensively in the literature. Also, since the GHHSC is the primary referral center, location was selected to determine if geographic location could affect risk factor identification documentation and management.

The only variable reaching a level of statistical significance was that of age in relation to completion of the two CV risk factor forms. If age was > 70 years it was predictive of non-completion of the two CV risk factor forms ($p < 0.001$). (see data appendix K)

4.3 Results pertaining to phase II:

Of the total 52 survey questionnaires distributed to cardiology staff in October 2000, the initial response rate was 35% (n=18). Following mail out of reminder letters there was an additional 10% (n=5) return. With the remaining initiatives

from November 2000 through January 2001, including placement of reminder signs on the cardiology floor, making survey packages available at the January nurses' staff meeting and personal reminders to four cardiologists, the final result was completion of 41 of 52 survey questionnaires (79% response rate) (See table 4.5).

Table 4.5: Cardiology staff survey questionnaire response rate by specialty:

	# survey questionnaires distributed	# completed survey questionnaires returned	Response rate (%)
Cardiologists	8	7	88%
Nurses	43	33	77%
Dietician	1	1	100%
Total	52	41	79%

Survey questions addressing the perceptions of cardiology staff in terms of roles and responsibilities included:

1) *Who, of the following health professionals, do you think should be involved in risk factor* ***identification and documentation*** *during the hospitalization period?*

2) *Who, of the following health care professionals, do you think should be involved in a risk factor **management** strategy (including education) during the AMI hospitalization period?*

In both questions, respondents almost unanimously agreed (40 of 41 respondents or 98%) that all of the stated health professionals including cardiologists, nurses and dieticians should be involved in the identification, documentation and management of risk factors. (see table 4.6) Results are reported in aggregate to maintain anonymity.

Table 4.6 Cardiology staff perceptions of roles and responsibilities for in-hospital CV risk factor identification, documentation and management.

All respondents answered the following:	**Responses:**	
Who should be involved in CV risk factor identification & documentation?	**Frequency n=41**	**Percent**
Cardiologist	0	0%
Nurse	1	2%
Dietician	0	0%
All	40	98%
Who should be involved CV risk factor management?		
Cardiologist	1	2%
Nurse	0	0%
Dietician	0	0%
All	40	98%

Other findings of interest:

- Despite the fact that all survey respondents had at least three months experience on the cardiology floor, it was determined that the level of awareness for the December 1998 implementation of a cardiovascular risk factor management strategy was low. More than one third (37%) of respondents were not familiar with the standing order to measure lipid profiles in the CCU. Forty-two percent were not familiar with the *CV Risk Factor Profile Form*; 46% were not familiar with the *CV Risk Factor Management Form* and 27% were not familiar with the *Cardiac Education Form*. (see table 4.7)

Table 4.7 Awareness of CV risk factor management strategy including lipid profile measure in CCU (CCU order) and three chart forms

Awareness of:		Frequency n=41	Percent
CCU order	Yes	25	*61%*
	No	15	*37%*
	Unsure	1	*2%*
CV risk factor profile form	Yes	24	*58%*
	No	17	*42%*
	Unsure	0	*0%*
CV risk factor management form	Yes	22	*54%*
	No	19	*46%*
	Unsure	0	*0%*
Cardiac education form	Yes	29	*71%*
	No	11	*27%*
	Unsure	1	*2%*

- Survey responses pertaining to the frequency of adequate cardiovascular risk management in the current time period (fall 2000) are reported. Only 22% of respondents said risk factor management was adequate all of the time or most of the time (all of the time 2%, most of the time 20%); the majority of respondents, 76%, answered some of the time (see figure 4.1).

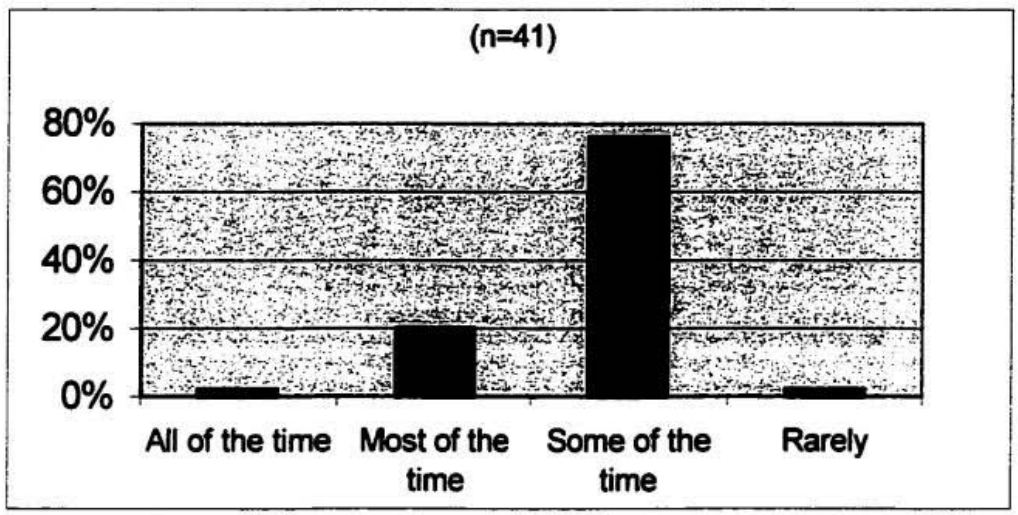

Figure 4.1: Staff perceptions, frequency of adequate risk factor management

- According to 100% of respondents, risk assessment and education should begin before the day of discharge (either in CCU or post CCU but before the day of discharge). However, 51% of respondents report that risk factor assessment and education actually takes place on the day of discharge (see figure 4.2).

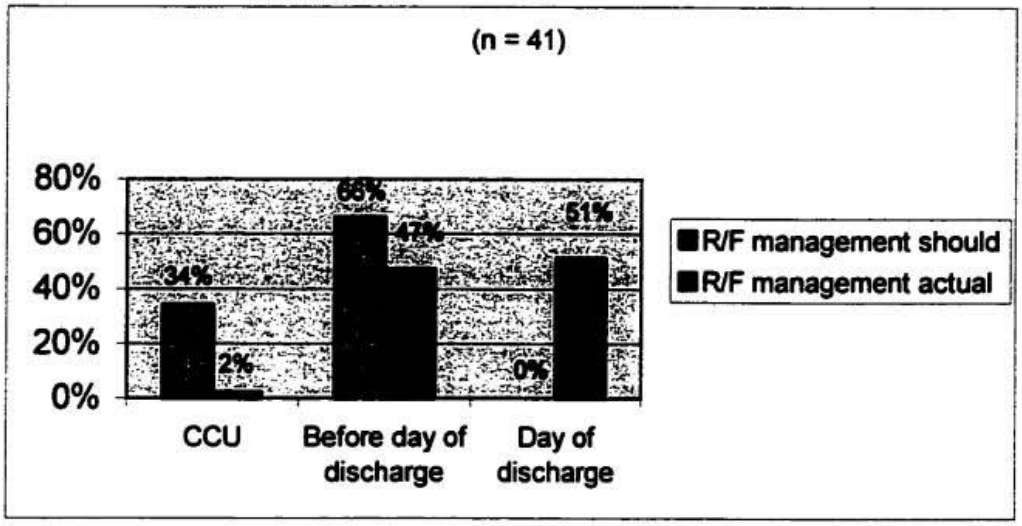

Figure 4.2: Cardiology staff feedback on when in-hospital risk factor assessment and education should begin v.s. when it actually begins.

- Despite the low level of awareness for the strategy itself, forty–six percent of respondents agree that the December 1998 risk factor management strategy has improved the status of risk factor identification, documentation and management at the GHHSC.

Summary of additional comments included on survey questionnaires by respondents:

- Of the thirty-three nurses who completed survey questionnaires, in thirteen cases there were unsolicited comments referring to the need for a full time cardiac teaching nurse for 5SA. Reference was consistently made

to the lack of available time to dedicate to the important responsibility of risk factor management and education. Several comments referred to the current situation as being *"unfair to patients"*. It was also said that, *"without someone assigned specifically to that duty, it will not get done"*.

- Ten respondents included physiotherapists as an allied health professional with a potential role in risk factor management, in particular for "*teaching and establishing an exercise regime*". The social worker and pharmacist each received one mention as potential participants for overall risk factor management planning.

- The staff dietician was noted specifically on one questionnaire as the person "*seeing patients routinely for counseling before the day of discharge*".

- The cardiovascular risk factor forms are not being seen by cardiologists in all cases.

- There was one remark with the perception that the dietician and nurses were doing all they could do to manage risk factors, but Cardiologists, as a group, were not.

- There appears to be *"uneven application of cardiac teaching and completion of risk factor forms, likely in relation to human resource availability".*

- Ongoing updating/education of staff nurses regarding issues relating to cardiovascular risk factor management would be appreciated.

- Improvements seen in cholesterol management may be *"due to recent publications and new guidelines".*

- The need for *"continuity of care of risk factors post-hospital discharge needs to be addressed. Although in-hospital education is very important it should not stop there. Some follow up with cardiac rehab and or the family physician is needed".*

4.4 Summary of results:

The statistical findings of phase I address the objectives of the before/after comparisons of chart reviews. Specifically the analyses indicate that the December 1998 in-hospital CV risk factor management strategy was partially effective to improve identification, documentation and management of risk factors.

Phase II of this study demonstrates clarity or consensus among cardiology staff members that a team approach, including cardiologists, nurses and dieticians is desirable for in-hospital CV risk factor identification, documentation and management. Taking that consensus and moving it forward so that it becomes practice is the challenge for the future.

CHAPTER 5

DISCUSSION

5.0 Review

The purpose of this study was to examine the effect of an in-hospital cardiovascular risk factor management strategy in high-risk post-AMI patients at the GHHSC and to assess the perceptions of cardiology staff members in terms of roles and responsibilities for cardiovascular risk factor identification, documentation and management.

Review of the literature clearly identified management of cardiovascular risk factors as a key component of preventive care. In the high-risk secondary prevention post AMI population, reduction of cardiovascular risk factors has been proven to reduce morbidity and mortality (5,7,9,41,42).

The literature identifies the ongoing problem of achieving cardiovascular risk reduction in the real world situation (18,19). Although reasons for this lack of success are likely multifactorial, it has been suggested that the acute hospitalization period, such as post-AMI, represents an opportunity to begin a long-term plan for cardiovascular risk reduction in a high-risk population, this is a challenge requiring a well planned and implemented strategy (16,17,21,67,79). The cardiovascular risk management strategy implemented at the GHHSC in December 1998 was an attempt to intervene in the high-risk AMI population. Within the strategy, process changes were implemented to streamline and

enhance risk factor identification, documentation and management for post AMI patients. This study sought to determine the effectiveness of the strategy.

The following discussion will focus on topics from the methods section and the results section of this paper.

5.1 Methods discussion

5.1.1 Development and initiation of the 1998 strategy

Phase I of this research compared the identification, documentation and management of risk factors in the before and after groups. The results demonstrated partial success in terms of improvement in the after group. Following is a discussion of possible methodological reasons for the limited success of the 1998 strategy.

The original planning committee for the 1998 strategy included a cardiologist, an endocrinologist, two nurses and a dietician from the cardiology division, thus representation from each discipline involved. However, co-ordinated group planning meetings were not routinely held. Despite the fact that surveyed staff members had more than three months experience on the cardiology floor, it was evident from the survey results that many staff members were not familiar with the strategy or were familiar with only part of it (27% - 46% of respondents said

they were not aware of aspects of the strategy, see table 4.8). This lack of awareness may have had a negative impact on the implementation of the strategy.

Specifically, for the three new chart forms implemented within the risk management strategy (*CV risk factor profile form, CV risk factor management form and cardiac education form*), the rate of utilization (completed forms on charts) was very low at only 27%, 27% and 62% respectively. Possible reasons for this low level of utilization include:

a) Lack of awareness or commitment to the use of the forms or the strategy itself.

b) Lack of some process to facilitate ease of form utilization. The nurses or the dietician were required to go to a specific filing cabinet to obtain forms and add to the patient chart, they were not routinely included as part of the chart that is prepared in advance by the ward clerk.

c) Early in the period after the forms were implemented, it was noted that the first two forms required a tick off of risk factor(s) "only if present", raising the question, if a tick was absent, was it by design or omission? Also, staff members realized that significant time was being spent completing forms, which, to their knowledge, were not being seen by the cardiologists or resulting in follow up after discharge. Suggestions for improvements were made and forms revisions began within six months of implementation. Therefore, the enthusiasm for the original forms may have diminished. Lastly, during planning for the original strategy, the

need for a transition letter to patients' family physicians describing their risk profiles had been discussed. This also did not happen, perhaps once again dampening enthusiasm for the overall strategy and negatively affecting its potential success.

It is possible that the results of the overall strategy could have been very different if full implementation of the chart forms had occurred. Perhaps a more collaborative, ground up approach, which sought to gain input from all cardiology staff members for the strategy development and implementation, would have resulted in increased utilization of forms and thus the strategy.

When used, the new chart forms facilitated a more comprehensive overview of patients' risk management planning and the specifics of teaching, including resources used. Previously, for example, the education or teaching documented in the chart was minimal, often evidenced as a simple statement that cardiac teaching was done. The forms, when used, resulted in enhanced quality of documented information.

5.1.2. Chart abstraction

Through the months of August to December of 2000, the researcher abstracted all study charts in the medical records department. By chance, the first 100 charts reviewed were from the after group. Once review of charts from the before

group began it became clear that the *Cardiac education form* available on the "after" charts was not included in the "before" charts; this was another new form. Originally, the researcher had been informed of only two chart forms involved in the December 1998 risk management strategy. Following investigation with the cardiology nursing staff, it was confirmed that, indeed, this third chart form was implemented at the same time as the *CV risk factor profile form* and the *CV risk factor management form.* Therefore, upon request by the thesis supervisor and investigator, medical records staff retrieved the first 100 charts from the after group to identify whether the education form was utilized. This information was necessary to obtain utilization rates for this newly identified form.

Had the review of "before" charts been completed first, there would have been no need to retrieve the 100 "after" charts for a second review.

5.2 Results discussion

5.2.1 In-hospital mortality

The in-hospital mortality reported for the GHHSC, the tertiary care center for the province, was 18% in the before group and 13% in the after group. These rates are similar to the AMI mortality rate reported in the ICONS population, which includes AMI patients entering any ICONS affiliated hospital within the province of Nova Scotia, whether it is a community hospital or the tertiary care center. The

ICONS aggregate AMI in-hospital mortality rate reported in the spring of 2000 was 14.4% (31).

A 1996 study, *Myocardial Infarction Patients in the 1990s – Their Risk Factors, Stratification and Survival in Canada: The Canadian Assessment of Myocardial Infarction (CAMI) Study*, recruited 4,133 AMI patients in nine hospitals (eight university and one community-based) in Canada. The GHHSC was one of the sites in the CAMI study. Patients were identified by reviewing all daily hospital admissions to the CCU or ICU as well as through routine questioning (three times per week) of cardiologists on call in order to access any off service AMI patients within the hospital. Finally, all emergency room deaths were reviewed and patients meeting study criteria for AMI were included in the study.

For patients of all ages recruited to CAMI after November 1, 1991, the in-hospital mortality rate was 9.9%. This rate is lower than the 18% (before group) and 13% (after group) rates reported in the current research. In younger CAMI patients who were less than or equal to 75 years (93% of the population), the in-hospital mortality rate was 8.4%. The in–hospital mortality rate for the older groups was higher (>70 years to 75 years was 15.8 % and > 75 years was 27.6%) (68).

The reported in-hospital mortality rates of 18% and 13% for the before and after groups respectively in the current research initially seem high when compared to

9.9% for all patients in CAMI. When one considers the demographics of the current study population (25% > 70 years in the before group and 42% > 70 years in the after group versus 23% > 70 years in the CAMI population), it could be that the increased representation of elderly patients in this research has contributed to the higher mortality rates. However, that seems unlikely with the highest percentage (42%) of elderly patients included in the after group with the lower, 13% in-hospital mortality rate.

Perhaps of more importance when considering possible reasons for the mortality differences, the CAMI study had strict recruitment procedures and criteria to determine AMI eligibility. The current research involved simple identification of an ICD 9 code 410 from an administrative database. The populations identified through two such differing processes were likely very different, making comparisons less than optimal.

5.2.2 Non-documentation of risk factors

The patient chart is the ultimate source of information and communication (72). Without documentation of particular risk factors such as smoking and hyperlipidemia it is intuitive, although not yet proven, that there will be less management of them.

Findings of the current research in terms of non-documentation of risk factors are

similar to the findings of the ICONS project. Non-documentation of diabetes status was 24% in ICONS versus 22% and 25% (before versus after groups respectively in the current research), cholesterol status non-documentation was 27% in ICONS versus 27% and 22% in the current research and non-documentation of smoking status was 6% in ICONS versus 13% and 12% in the current research (23).

As early as 1995 the issue of non-documentation, although not termed as such, was being investigated by a group of Canadian researchers, the Clinical Quality Improvement Network (CQIN). Their study, *Low Incidence of Assessment and Modification of Risk Factors in Acute Care Patients at High Risk for Cardiovascular Events, Particularly Among Females and the Elderly* (71), detailed the patterns of assessment and treatment of serum lipids and other modifiable risk factors in 3,304 hospitalized high-risk patients for cardiovascular events in four acute care Canadian hospitals. The investigators found the most prevalent documented risk factor was hypertension (46%). Diabetes, obesity, smoking, dyslipidemia and positive family history were reported in 21% - 28% of patients. Sedentary lifestyle was documented in only 3% of patients. Similarly, there was a low rate of lipid assessment (28% overall) and documented management of lipids and lifestyle risk factors was low.

Based on the low level of recorded risk assessment and management, the CQIN

investigators hypothesized that more risk assessment and management was being performed than was actually being recorded on the patient chart. A substudy comparing recorded risk assessment and management with data obtained directly from patients before discharge was performed in 117 high-risk patients. Substudy results found that there was slight underreporting of the assessment of smoking status and sedentary lifestyle, but there were no differences between patients' records and their responses to questions pertaining to assessment of hyperlipidemia or for being prescribed lipid lowering diet and/or drug therapies. The medical record therefore appeared accurate as a true reflection of cardiovascular risk assessment and management in the acute care setting. Although an accurate reflection, it was clear that the level of risk assessment and management was low. The CQIN investigators concluded that there appeared to be a widespread gap in the application of clinical trial and epidemiological knowledge regarding risk-lowering measures in this high-risk population. They challenged cardiologists to find ways to improve practice and outcomes in one of the most important diseases in society. Three years later, in initiatives such as the December 1998 GHHSC risk management strategy, that challenge is being addressed.

Recent advances toward the establishment of electronic patient records could be one solution to improving the assessment and documentation of risk factors. In 1999, researchers in Illinois investigating the impact of electronic patient records

on practice found that this method significantly increased the documentation of assessment for decision making and more appropriate documented decision making as judged by an expert panel (72). It could be argued that an electronic patient record system that prompts for appropriate documentation would offer solutions to numerous aspects of patient care including the issue of chart non-documentation of cardiovascular risk factors and subsequent management.

5.2.3 Comparison of before/after risk factor identification and documentation

Only one of seven variables selected to determine cardiovascular risk factors, history of previous CAD, was statistically significantly increased in the after group versus the before group. Documentation of previous MI and cholesterol status showed a positive trend (perhaps if the sample size was larger they would have reached a level of statistical significance); otherwise, variables were largely unchanged (see table 4.3). The intervention can be considered only partially successful in improving identification and documentation of cardiovascular risk factors. It must be noted, however, that the implementation of the intervention itself was only partial (27%, 27% and 62% utilization of the *CV risk factor profile, CV risk factor management and Cardiac education form* respectively), which likely had a negative impact on the results.

5.2.4 Comparison of before/after risk factor management

Of the eight variables selected to determine risk factor management, four were

significantly improved in the after group versus before. A greater number of patients had their lipid profiles measured, were started on lipid lowering medications before discharge, received stress counseling and smoking cessation counseling (see table 4.4). Documented requests for follow up of lipids or smoking cessation were unchanged. Surprisingly there were significant changes seen in the before group in terms of diet and exercise counseling. Overall, in terms of the strategy, there was a greater improvement reported (four of eight variables with $p < 0.001$ for each) for management of risk factors than for the identification and documentation of risk factors (one of seven variables with $p < 0.04$). The improvement in lipid management can likely be attributed to the routine order for lipid measurement within 24 hours of admission to CCU as well as to temporal changes occurring with increased awareness of publications and guidelines supportive of lipid management in high-risk patients. The climate in the year 1999-2000 was more conducive to in-hospital lipid management than was the case during the baseline measurement of this research in 1997-1998.

It remains puzzling that diet and exercise counseling results were better in the before group. It could be that human resource issues, such as staff shortages, contributed to this result, or it could somehow relate to the implementation of the new chart forms. Possibly staff members who did not use the additional chart forms left it for another to do. In the surveys it was evident that the dietician was noted as playing a major role in completion of the forms. Perhaps staff began to

see it as her role alone. Whether the difference is in the actual level of counseling given, or its documentation, remains unclear.

5.2.5 Timing of lipid measurement post AMI

At the time of the current research there was considerable debate as to when lipid profiles should be measured in post AMI patients. The acute phase response phenomenon, which occurs usually after the 24-48 hour post-event period, tends to lower total and LDL cholesterol levels (46), which could lead to inappropriate reporting of normal levels in those with elevated levels sustained over the long term. Therefore, it is important that if measured in-hospital, the lipid profile should be obtained early (within 24 hours at the GHHSC).

Large clinical trials such as 4S and CARE studies (41,42) have demonstrated mortality and morbidity benefits in AMI patients treated with statin drugs post event, but those trials initiated therapy three to six months after the event. It is recognized that this delay in treatment has likely resulted in missed opportunities to intervene in this high-risk population. Very recently however, the CHAMP study (79) and the Swedish Registry study (67) reported mortality benefits at one year in high risk patients treated with a statin before or at the time of hospital discharge versus those not treated. These new data support the opportunistic top down, in-hospital approach for lipid management as discussed in this paper. The in-hospital initiation of statin treatment post AMI is more widely accepted

currently in 2001 than was the case during the time of this research. To optimize the benefits obtained with statin drugs post AMI, some cardiologists will initiate therapy in-hospital with a plan to decrease or discontinue, if necessary, at the time of follow-up. The obvious key to whichever strategy is selected is planning and follow-up.

5.2.6 Survey questionnaire results

Results of the cardiology staff survey questionnaires suggest that staff members view cardiovascular risk factor identification, documentation and management as an essential part of patient care in the acute care setting. There is consensus among staff members that all have a role to play in achieving an appropriate level of risk factor identification, documentation and management. The most common reason given for lack of attention to risk factors during hospitalization by survey respondents (nurses only) was lack of time. The recommended solution (also by nurses) was to hire a full time nurse educator who would be responsible for risk factor management. Such a position would answer the immediate short term resource issue, but over the long term, the challenge would be to create a collaborative team approach to risk factor assessment and management as was suggested from staff survey results. The goal should be a strategy that begins in hospital and extends beyond the acute care setting to the primary care physician for long-term follow-up and management.

It would have been very interesting to assess whether staff members' length of experience on the cardiology floor influenced survey responses. However, due to the small numbers involved and the need to maintain confidentiality, this was not feasible in the current research. Anecdotally, the majority of additional comments that were received, especially in the case of the nurses, came from those with more than four years experience.

5.3 Limitations of the Study

- The study has been restricted by certain conditions that were beyond the researcher's control. These data were gathered from a two and one half year time period. The short time period examined likely will not be representative of the situation in some retesting period.

- During this time period, a restructuring of cardiology services occurred that resulted in more cardiologists being involved in care of patients at the GHHSC. During 1997–1998 there were four cardiologists responsible for patient care in the CCU and on the cardiology unit, whereas during 1999–2000 there were six to eight cardiologists. Therefore, charts reviewed in the after time period captured a new mix of practice patterns including these additional physicians, which could account for some of the differences.

- The study has also been restricted in terms of the voluntary nature of the sampling of cardiology staff for the survey questionnaire portion. There may be a bias in terms of who responded to the survey questionnaire and it is possible that the ideas of individuals choosing not to participate differ significantly from those who completed survey. However, with a near 80% response rate (missing only one of eight cardiologist and 10 of 43 nurses) these results likely reflect the opinions of the majority.

- Information pertaining to in-hospital management of risk factors obtained in this study came solely from chart reviews. It may be that risk factor education and management planning were discussed and/or implemented, but not documented. That would result in an over estimate of the problem of sub-optimal risk factor management. However, non-documentation is a component of the problem being investigated.

- The scope of the study has been limited to hospitalized, AMI patients. Therefore, results of this study may not be descriptive of other, similar, although not acute populations such as community patients with CAD.

- The study has been restricted to one hospital site within the Health Care Corporation in St. John's. Findings cannot be considered representative of some other hospital in St. John's or other geographic locations.

CHAPTER 6

IMPLICATIONS AND CONCLUSIONS

6.0 Implications and conclusions

The following chapter will discuss possible implications of the current research findings and conclusions.

6.1 Implications of current research

6.1.1 Further development of the strategy

Emerging evidence supports the acute hospitalization period as an appropriate starting point for cardiovascular risk factor management (67,79). Several positive opportunities exist for future cardiovascular risk factor management at the GHHSC. The tested strategy for this research should be considered a pilot project where issues and opportunities were identified to facilitate future improvements. Perhaps the fact that there was only partial implementation of the strategy resulted in the limited improvements seen in the identification, documentation and management of cardiovascular risk factors.

Currently, the chart forms are being revised and a part time teaching nurse position has been added on the cardiology floor. The challenge will be to further develop and implement the in-hospital risk reduction strategy ensuring input and collaboration of all staff. The addition of further resources such as critical path algorithms, to prompt staff through patient care as recommended by guidelines, could enhance the success of the strategy as well (50,79). There is currently an

opportunity to utilize the added nursing position to further develop the current strategy and perhaps take it a step further by linking it to community primary care physicians. This nursing position has the potential to do much more than one on one patient education. Considering the current low level of awareness for the strategy among staff members, there is surely a need to re-launch the new and improved strategy in some collaborative way.

6.1.2 Chart non-documentation

This research has added to the emerging literature pertaining to lack of chart documentation. This problem affects not only individual patients, but also raises concerns about research based on chart reviews where data are abstracted for various epidemiological studies including calculation of rates. Without a true picture of which patients actually have a condition, i.e. diabetes, the numerators and denominators for these studies will be inaccurate. It is incorrect to assume that if something is not documented it is not present. Further research is required to quantify the situation and find ways to correct the problem. As previously mentioned, chart forms that are developed and implemented in a collaborative way (29) and/or the evolution of electronic patient records (36) offer potential solutions, which require evaluation.

6.1.3 Continuous quality improvement

Continuous quality improvement is an essential component of health care; ongoing feedback of quality indicators such as those examined in this research assist with quality assurance. A yearly review and feedback of findings from a sample of AMI patients to examine cardiovascular risk factor identification, documentation and management, and perhaps utilization rates of evidence-based therapies including ASA, beta blockers, statins and angiotensin converting enzyme inhibitors, could be completed with minimal resources. Such a practice would add greatly to quality assurance efforts for the division of cardiology at the GHHSC.

6.1.4 Post AMI patient education

Although efforts are focused on education of patients post-AMI in-hospital, it is unclear whether patients comprehend and retain information received in the acute care setting over the long term. Opportunities exist now, although limited in terms of availability for all, for early outpatient education through the cardiac rehabilitation program or in collaboration with primary care. Future research could examine post-AMI patients who have received different types of education interventions with different timings, to assess over the long term which strategies work best to change behaviors and/or improve patient health outcomes.

6.1.5 Further improvement in lipid management

This research identified increased measurement of lipid profiles with the addition of the CCU routine standing order to do so. It also identified 29 documented cases where reported lipid values were above recommended levels and patients were discharged home without treatment. It may be that later follow up was planned and not documented on the chart or it may be that these were missed opportunities to intervene with high-risk patients. Examples of success in similar situations have been reported in the CHAMP study with the use of algorithms (50,79) and in the UK with nurses empowered to prompt physicians to treat when levels exceeded recommended values (30). Such initiatives could be tested or implemented at the GHHSC to improve treatment of lipids when appropriate.

6.2 Conclusions

Cardiovascular disease is one of the most deadly diseases worldwide; in Canada it is the leading cause of death. Due to significant research initiatives over the past two to three decades many advances in knowledge of prevention and treatment of cardiovascular disease have been elucidated. The future challenge is to not only continue the pursuit of new and innovative strategies to improve prevention, treatments and health outcomes, but also to ensure implementation of the numerous strategies already proven beneficial.

The current cardiovascular risk reduction strategy examined within this paper was only partially effective in improving identification, documentation and management of cardiovascular risk factors. Improvements likely were seen, in part, due to the strategy examined herein; otherwise the new mix of cardiologists delivering care in the after time period or the temporal trend of improving lipid management in the hospital setting may have been contributors to the changes seen in the after population.

Given the current situation at the GHHSC with a) agreement among cardiology staff that all have a role to play in risk management in-hospital, b) the addition of a staff nurse position for patient teaching and c) the planned feedback of findings from this research, the future holds promise for an improved risk management strategy.

Ongoing analysis of the risk reduction strategy is necessary to measure its effectiveness. Research evaluating the bridging of cardiovascular risk reduction from the acute hospitalization period to community primary care physicians is an exciting new challenge.

Improvements in the process of care delivery should lead to improvements in patient health outcomes. The CHAMP data and the Swedish registry data support this hypothesis. As numerous health care centers and personnel invest

time and resources to optimize processes of care, ongoing monitoring and research are essential to test these strategies and measure their effectiveness.

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APPENDICES

Memorial
University of Newfoundland

Office of Research and Graduate Studies (Medicine)
Faculty of Medicine
The Health Sciences Centre

July 11, 2000

TO: **Ms. B. Cochrane**

FROM: Dr. F. Moody-Corbett, Assistant Dean
Research & Graduate Studies (Medicine)

SUBJECT: Application to the Human Investigation Committee - #00.92

The Human Investigation Committee of the Faculty of Medicine has reviewed your proposal for the study entitled **"Has a Strategy to Improve Cardiovascular Risk Assessment and Management Post Acute Myocardial Infarction at the Health Sciences Centre Been Successful?"**.

Full approval has been granted for one year, from point of view of ethics as defined in the terms of reference of this Faculty Committee.

For a hospital-based study, it is **your responsibility to seek necessary approval from the Health Care Corporation of St. John's**.

Notwithstanding the approval of the HIC, the primary responsibility for the ethical conduct of the investigation remains with you.

F. Moody-Corbett, PhD
Assistant Dean

cc: Dr. K.M.W. Keough, Vice-President (Research)
Dr. R. Williams, Vice-President, Medical Services, HCC

HealthCare
Corporation of St. John's

July 26, 2000

Ms. B. Cochrane
13 Westminster Drive
Mount Pearl, Newfoundland
A1N 4M9

Dear Ms. Cochrane:

Your research proposal ***HIC 00.92 - Has a Strategy to Improve Cardiovascular Risk Assessment and Management of AMI at the Health Sciences Centre been Successful*** was reviewed by the Research Proposals Approval Committee (RPAC) of the Health Care Corporation of St. John's at its meeting on July 25, 2000, and we are pleased to inform you that the proposal has been approved.

This approval is based on the understanding that it has the necessary funding and that it is being conducted at the General site only. Additionally, the Committee requires a progress report to be submitted annually.

If you have any questions or comments, please contact Lynn Purchase, Manager of the Patient Research Centre, at 737-7283.

Sincerely,

Pamela Elliott
Vice President
Patient Care Services

mh
c Ms. Lynn Purchase
Manager
Patient Research Centre

General Hospital
Health Sciences Centre, 300 Prince Philip Drive, St. John's, Newfoundland, Canada A1B 3V6 Tel. (709) 737-6300 Fax (709) 737-6400

Acute MI Chart Audit Form **(Appendix C)**

Patient study # _____ Age _____ D.O.B _ _/_ _/_ _

(dd/mm/yy)

Sex : M ☐ F ☐ Address (city)_____

Discharge Diagnosis_____

Date of Admission _ _/_ _/_ _ (dd/mm/yy) Date of MI _ _/_ _/_ _ (dd/mm/yy) Date of discharge _ _/_ _/_ _ (dd/mm/yy)

Is the HSC: Admission Site ☐
Referral Site ☐

Total Length of stay since MI _____days
Days at HSC _____days
Days at previous hospital _____days

Documentation of risk factors: (N/D = Not Documented in chart)

Previous MI : Yes ☐, No ☐, N/D ☐

Previous evidence CAD: Yes ☐, No ☐, N/D ☐
If yes, explain_____

Positive Family History Yes ☐, No ☐, N/D ☐

Known elevated Cholesterol : Yes ☐, No ☐, N/D ☐

Lipids measured within 3 mos. prior to MI
Or Lipids measured in hospital : Yes ☐, No ☐, N/D ☐

Patient on Lipid lowering therapy on admission Yes ☐, No ☐ N/A ☐
If yes, explain _____

Past smoker: Yes ☐, No ☐, N/D ☐

Current Smoker: Yes ☐, No ☐, N/D ☐

Hypertension: Yes ☐, No ☐, N/D ☐
If yes, on treatment : Yes ☐, No ☐, N/D ☐
If yes, explain_____

Diabetes: Yes ☐, No ☐, N/D ☐

If Diabetic, on treatment : Yes ☐, No ☐, N/D ☐ N/A ☐
Explain_____
_____

Interventions:

Lipid profile ordered according to standing CCU order: Yes ☐, No ☐ No result ☐
If no, any explanation :_____
_____

Are two risk factor forms complete: Yes ☐, No ☐
Is Nursing form complete: Yes ☐, No ☐

Are risk factors documented elsewhere on chart: Yes ☐, No ☐

If yes, where :
Physicians note ☐
Nurses note ☐
Dieticians note ☐
Other ☐
Explain_____

Action / plan based on risk factor identification:

Lipid lowering therapy in hospital: Yes ☐, No ☐, N/A ☐

Plan to measure lipids in near future: Yes ☐, No ☐, N/D ☐N/A ☐

Smoking cessation effort in hospital: Yes ☐, No ☐, N/D ☐, N/A ☐

B/P Managed in hospital: **Yes ☐, No ☐, N/D ☐, N/A ☐**

B/P on admission _____

B/P at discharge _____

Diabetes Managed in hospital: **Yes ☐, No ☐, N/D ☐, N/A ☐**
Bld. Sugar on admission _____
Bld. Sugar at discharge _____

In hospital lifestyle discussion re:

Diet: **Yes ☐, No ☐, N/D ☐**
By whom:
Physician ☐
Nurse ☐
Dietician ☐
Other ☐_____

Stress: **Yes ☐, No ☐, N/D ☐**
By whom:
Physician ☐
Nurse ☐
Dietician ☐
Other ☐_____

Exercise: **Yes ☐, No ☐, N/D ☐**
By whom:
Physician ☐
Nurse ☐
Dietician ☐
Other ☐_____

Is there a plan for lipid follow up: **Yes ☐, No ☐, N/D ☐, N/A ☐**

Is there a plan for smoking cessation follow up: **Yes ☐, No ☐, N/D ☐, N/A ☐**

Is there planned follow up with Primary care physician: **Yes ☐, No ☐, N/D ☐**
Specialist: **Yes ☐, No ☐, N/D ☐**

POST MI Cardiac Risk Assessment Questionnaire **(Appendix D)**

Completion of this questionnaire should take about 5-10 minutes. All comments are appreciated. All completed questionnaires can be left in the envelope labeled RISK ASSESSMENT QUESTIONNAIRES in Marie Duffett's office on 5SA or the EKG Dept. or the Cath Lab. Thank you for your participation.

1. What is your position within the cardiology division at the Health Sciences Center?

   Cardiologist ☐
   Nurse ☐
   Dietician ☐
   Other ☐ explain _____

2. Please indicate length of time you have worked in Cardiology at the Health Science Center (HSC).

   Less than six months ☐
   Six months to less than one year ☐
   One to two years ☐
   Three to four years ☐
   Five to ten years ☐
   More than ten years ☐

3. Were you working in Cardiology at the HSC before the implementation of the CV Risk management strategy in Dec. 1998?

   Yes ☐
   No ☐

4. Do you perform any in-hospital post MI risk factor management / teaching?

   Yes ☐
   No ☐

   If Yes, is it:

   Formal (dedicated time for discussion) ☐
   Informal (general interaction, ie. bedside conversation) ☐
   Explain_____
   _____

5. Are you familiar with the standing CCU admission order to measure fasting lipid profiles in acute MI patients that was implemented in Dec.1998?

   Yes ☐
   No ☐
   Not sure ☐

6. Are you aware of the risk factor form titled, **CV Risk Factor Profile** that was implemented in Dec.1998? (see attachment #1)

   Yes ☐
   No ☐
   Not sure ☐

7. Are you aware of the risk factor form titled, **Risk Factor Management Plan** that was implemented in Dec.1998? (see attachment #2)

   Yes ☐
   No ☐
   Not sure ☐

8. Are you aware of the education from titled, **Cardiac Education Form** that was implemented in Dec. 1998? (see attachment #3)

   Yes ☐
   No ☐
   Not sure ☐

9. How often do you feel patients are receiving adequate education regarding risk factor reduction while in hospital?

   All of the time ☐
   Most of the time ☐
   Some of the time ☐
   Rarely ☐
   Never ☐

10. Who, of the following health care professionals, do you think should be involved in risk factor **identification and documentation** during the hospitalization period? (please check all that apply)

Cardiologist ☐
Nurse ☐
Dietician ☐
Other ☐ _____
Please explain _____

11. Who, of the following health care professionals, do you think should be involved in a risk factor **management** strategy (including education) during the MI hospitalization period?

Cardiologist ☐
Nurse ☐
Dietician ☐
Other ☐ _____
Please explain _____

12. When, in the post MI period, do you think risk assessment / education should begin?

In CCU ☐
Early post CCU to day before discharge ☐
Day of discharge ☐
Other ☐ _____
Please explain _____
_____

13. From your observation, when does risk assessment / education for these patients usually occur?

In CCU ☐
Early post CCU to day before discharge ☐
Day of discharge ☐
Other ☐ _____
Please explain _____
_____

14. In Dec.1998 a standing order for lipid profile measurement was implemented in CCU and risk assessment/education forms were introduced to 5SA? Do you think risk identification, documentation and management has improved for acute MI patients since that time?

Yes	☐
No	☐
Unsure	☐
N/A (not working on floor prior to Jan.1999)	☐

Please explain_____

_____

15. Do you think the standard CCU order for lipid profile in MI patients that was implemented in Dec. 1998 has resulted in: (check all that apply)

Improved documentation of lipid risks	Yes ☐, No ☐, Unsure ☐
Increased measurement of lipid levels	Yes ☐, No ☐, Unsure ☐
Improved education pertaining to lipid management	Yes ☐, No ☐, Unsure ☐
Improved treatment of elevated lipid levels	Yes ☐, No ☐, Unsure ☐

16. Do you think the two Risk Factor forms that were implemented in Dec.1998 have resulted in: (check all that apply)

Improved assessment of cardiac risk factors	Yes ☐, No ☐, Unsure ☐
Improved documentation of cardiac risk factors	Yes ☐, No ☐, Unsure ☐
Increased education pertaining to cardiac risk factors	Yes ☐, No ☐, Unsure ☐

17. Do you think the Cardiac Education Form that was implemented in Dec. 1998 has resulted in: (check all that apply)

Improved assessment of cardiac risk factors	Yes □, No □, Unsure □
Improved documentation of cardiac risk factors	Yes □, No □, Unsure □
Increased education pertaining to cardiac risk factors	Yes □, No □, Unsure □

18. Do you have any additional comments pertaining to the assessment / management of cardiac risk factors in the Post MI patients:_____

_____

_____

_____

Thank you for your participation in this research project.
Bonnie S. Cochrane

Please make sure to complete the attached yellow card and take it and the completed questionnaire to one of the three drop off locations (Marie Duffett's office on 5SA or EKG or the cath lab).

13 Westminster Dr.
Mt. Pearl, Nfld.
A1N 4M9

(Appendix E)

October 2000

Dear

I am currently completing a Master of Science (Community Health / Epidemiology) at Memorial University of Newfoundland. The title of my thesis is: **Has a strategy to improve risk assessment and management post Acute Myocardial Infarction at the Health Sciences Center been successful?**

My study involves a chart audit of patients discharged with a primary diagnosis of Acute MI. The audit will include charts of patients discharged one year before, and after December 1998 when a risk factor assessment / management strategy was implemented at the Health Sciences Center, division of cardiology.

Input from cardiologists, nurses and dieticians working with acute MI patients is essential to my analysis of the current situation as well as formulating recommendations for future management. I am therefore asking for your assistance.

I have enclosed a survey questionnaire, which should take about 5-10 minutes to complete. Once completed, please drop it in the box labeled Risk Assessment Questionnaires in Marie Duffett's office on 5SA or the EKG department or the cath lab. Participation in this study is entirely voluntary and confidentiality is ensured - no names will appear on any survey forms. In order to allow follow up of non-returned surveys, I am also enclosing a "confirmation of survey completion card". This card is to be dropped in the separate envelope labeled Confirmation Cards found next to the box for questionnaires.

I anticipate completion of my thesis in early 2001. I will be happy to share my findings at that time, either formally or informally.

Thank you for your assistance.

Sincerely,

Bonnie S. Cochrane
MSc. Student
Memorial University of Newfoundland

(Appendix F)

Confirmation of survey
Questionnaire completion.

Signature: _____

Thank-You for your participation.
Bonnie S. Cochrane

HealthCare
Corporation of St. John's

Name:

MCP#:

Chart #:

Cardiovascular Risk-Factor Profile

Date: _____

Sites: ☐ Grace ☐ St. Clare's ☐ General

CARDIOVASCULAR DISEASE DIAGNOSES (Check all appropriate):

- ☐ Myocardial Infarction (Date): _____
- ☐ Angina Pectoris
- ☐ Heart Failure
- ☐ PTCA/Stent
- ☐ CABG
- ☐ Arrhythmia/Pacemaker
- ☐ Cerebral Vascular Disease
- ☐ Peripheral Vascular Disease
- ☐ Valvular Heart Disease
- ☐ Other _____

RISK FACTORS (Check if present):

- ☐ Male ≥ 45 years
- ☐ Female > 50 years or postmenopausal > 45 years not on H.R.T.
- ☐ Family history of premature CAD/Sudden death

Cigarette smoker

- ☐ Current — No. of packs _____ — No. of years _____
- ☐ Former — Date quit _____ — No. of packs _____ — No. of years _____

- ☐ Hypertension — Most recent BP _____
- ☐ Hyperlipidemia — Most recent lipid profile (please indicate date) _____
  TC _____ mmol/L HDL C _____ mmol/L
  LDL C _____ mmol/L TG _____ mmol/L
- ☐ Diabetes Mellitus — Most recent:
  FBS _____ HbA_{1c} _____
- ☐ Obesity — Height _____ Weight _____ Body Mass Index _____
- ☐ Sedentary Lifestyle
- ☐ Stress — Identified Stressors _____

RISK-FACTOR MANAGEMENT PLAN: (to be completed on discharge)

- ☐ ASA: _____
- ☐ Alpha Blocker: _____
- ☐ Beta Blocker: _____
- ☐ Calcium Channel Blocker _____
- ☐ Cholesterol Reducer _____
- ☐ Diuretic: _____
- ☐ ACE Inhibitor: _____
- ☐ Anticoagulant: _____
- ☐ Hormone Rx: _____
- ☐ Patient Education: _____
- ☐ Smoking Cessation: _____
- ☐ Dietary Modification: _____
- ☐ Activity Recommendation _____
- ☐ Stress Reduction: _____
- ☐ Lipid Clinic Referral: Yes ☐ No ☐
  Date referred: _____
- ☐ Other _____

White copy: Chart Yellow copy: Family Physician Pink copy: Lipid Clinic or other

HealthCare

Name:

MCP#:

Chart #:

Risk-Factor Management Plan

Date: _____

Sites: ☐ Grace ☐ St. Clare's ☐ General

Nutrition Recommendation	Patient Goals: _____
	Information given: _____
Smoking Cessation	Patient Goals: _____
	Information given: _____
Hypertension	Patient Goals: _____
Blood Pressure _____	
Date: _____	Information given: _____
Cholesterol	Patient Goals: _____
Total Cholesterol: _____	
HDL-C: _____	Information given: _____
LDL-C: _____	
Triglycerides: _____	
Exercise	Patient Goals: _____
	Information given: _____
	Referral to outpatient Cardiac Rehabilitation _____
Diabetes Mellitus	Patient Goals: _____
Hgb A_{1c} _____	
Date: _____	Information given: _____
	Home Blood Glucose Monitoring _____
Stress Reduction	Patient Goals: _____
	Information given: _____

You may wish to review these goals with your health care providers (eg: Community Health Nurse, Pharmacist, etc.). If you have any questions, please call 778-6443 or 737-6911.

White copy: Chart Yellow copy: Family Physician Pink copy: Lipid Clinic or other

ch-0036 1998

Appendix I

CARDIAC EDUCATION RECORD

Diagnosis: _____

Education Level: _____

Barriers to Learning: _____

_____

	Date	Reinforcement Needed		Family Present	Comments (Level of understanding, etc.)
		Yes	No		
Anatomy & Function					
Coronary Artery Disease & Risk Factors					
Angina & Use of S/L Nitroglycerine					
Myocardial Infarction & Post M.I. Activity					
Congestive Heart Failure					
Cardiac Catheterization					
Angioplasty/Stent Pre ____ Post					
Coronary Artery Bypass Surgery Pre ____ Post					
Valve Surgery Pre ____ Post					
Pacemaker Pre ____ Post					
Other:					
Cardiovascular Risk Factor Profile and Management Plan					

(Appendix J)

13 Westminster Dr.
Mt. Pearl, Nfld.
A1n 4M9

November 2000

Dear

I am currently completing a Master of Science (Community Health/Epidemiology) at Memorial University of Newfoundland. The title of my thesis is: **Has a strategy to improve risk assessment and management post Acute Myocardial Infarction at the Health Sciences Center been successful?**

In October you should have received a survey questionnaire, which will assist my analyses by giving important insight into staff perspectives on cardiovascular risk management, in the hospitalized MI patient. To date I have not received your completed survey.

Input from cardiologists, nurses and dieticians working with acute MI patients is essential to my analysis of the current situation as well as formulating recommendations for future management. I am therefore asking for your assistance. Please accept this as a reminder to complete the survey. If you did not receive one, or have misplaced the original, there are extras located in Sharon Meehan's office on 5SA.

Thank you for your assistance.

Sincerely,

Bonnie S. Cochrane
MSc. Student
Memorial University of Newfoundland.

Appendix K.1 Data utilized in logistic regression to examine predictors of risk factor management including: lipid measurement within 1st 24 hours of admission or previous three months (lipid measure), utilization of lipid lowering therapy at discharge (LLT at discharge), completion of two CV risk factor forms (2 forms complete) and completion of cardiac education form (Education form complete). Patients included in the analysis are those in the "after group" n=136

Variable		Lipid Measure	LLT at discharge	2 Forms complete	Education form complete
		n=87/136(64%)	n=42/136(31%)	n=37/136(27%)	84/136(62%)
		Yes	Yes	Yes	Yes
		n(%)	n(%)	n(%)	n(%)
Age	≤ 70	55(63)	28(67)	32(86)	52(62)
	> 70	32(37)	4(33)	5(14)	32(38)
	Total	87(100)	42(100)	37(100)	84(100)
Gender	Male	60(69)	29(69)	30(81)	57(68)
	Female	27(31)	13(31)	7(19)	27(32)
	Total	87(100)	42(100)	37(100)	84(100)
Location	CHR	66(76)	32(76)	29(78)	66(79)
	Non-CHR	21(24)	10(24)	8(22)	18(21)
	Total	87(100)	42(100)	37(100)	84(100)

Appendix K.2 Results of logistic regression analyses for predictors of CV risk management in the after group (n=136)

Variable	Lipid meas. In-hospital or previous 3 mos.	On LLT at discharge	Completion of 2 CV r/f forms	Completion of education form
	p value	p value	p value	p value
Age group	0.935	0.210	**< 0.005***	0.281
Gender	0.930	0.810	0.175	0.668
Location	0.956	0.732	0.426	0.583

* Statistical significance if $p < 0.05$