FACTORS INFLUENCING MEDICATION TAKING BEHAVIOURS OF A SAMPLE OF NEWFOUNDLAND ELDERLY WITH HYPERTENSION

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FACTORS INFLUENCING MEDICATION TAKING BEHAVIOURS OF A SAMPLE OF NEWFOUNDLAND ELDERLY WITH HYPERTENSION.

BY

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Abstract

Hypertension has been internationally recognized as a key risk factor for cardiovascular, cerebrovascular and renal disease in adults, particularly in the elderly population. The prevalence of hypertension in the Newfoundland population over 65 year old was 54% for females and 47% for males (Newfoundland Department of Health & Department of National Health & Welfare, 1990); the second highest provincial rate in Canada. Adherence to antihypertensive medication regimens was estimated at approximately 50% in North American adult populations examined.

The purpose of this study was to determine the factors associated with adherence to antihypertensive medications in a convenience sample of 51 hypertensive patients over 65 years old attending a family practice in St. John's, Newfoundland. The Health Belief Model was used as the conceptual model for the study. Ten selected factors from the Model were examined. Data were collected by structured interviews with participants in their homes using three instruments; (a) modified Weissfeld, Kirscht, and Brock Health Belief Scale, (b) the General Questionnaire, and (c) the Medication Evaluation Record. Adherence was measured using the Medication Evaluation Record which included an examination of medication containers, a medication count, chart review, and questionnaire developed by the interviewer.

Only 43.1% of the sample were adherent to their antihypertensive medication regimen. General health threats was the only factor from the Health Belief Model which demonstrated a significant association with

adherence. Increases in General Health Threats were significantly associated with greater nonadherence using Spearman's rank correlation coefficient (ρ = .004). Mean diastolic and systolic blood pressures were also significantly associated with adherence (ρ = .033 and ρ = .018 respectively). Increased mean blood pressures were associated with greater nonadherence.

The findings of this study indicated a significant negative relationship between General Health Threats and adherence, suggesting those with greater health threats adhered less to antihypertensive medications. Adherence was also significantly associated with mean diastolic and systolic blood pressure, indicating those who adhered more to antihypertensive medications had better blood pressure control. The implication for nursing and other health care professionals, therefore, includes recognition of the need for continued efforts toward improving adherence. Further research using a larger and more representative elderly population may provide more generalizable findings.

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To my children, Amanda and Colin, who gave me their love and understanding, I love you both. To my husband Alf; supporter, editor, computer consultant, and philosopher, I am forever indebted for your love and advice. To my siblings who kept me motivated and pushed me onward during the difficult times, I am thankful.

Most importantly, this accomplishment is dedicated to my late parents, who believed in the importance of life long learning. To my mother, who encouraged and supported me through the busy months of balancing study, work and family life, this project is dedicated to her memory. Although she did not live to see its completion, she would have been proud.

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CHAPTER I

Introduction

Hypertension has been identified as a significant health risk internationally, nationally and to an even greater degree, provincially in Newfoundland. The prevalence of hypertension in Canada today is reported at 16% compared to 9% in 1978-79 (Statistics Canada, 1994). The Newfoundland Heart Health Survey reported a 21% prevalence rate of hypertension in the province for the age range of 18-74 years (Newfoundland Department of Health & Department of National Health & Welfare, 1990). This prevalence rose to 54% in the female age group 65-74 years and 47% in their male counterparts (Newfoundland Department of Health & Department of National Health & Welfare, 1990). No data were available for the group older than 74 years old from the latter study. The Canadian age specific prevalence rate was reported at 41% in the female population over 65 years and 31% in males (Health & Welfare Canada, 1989). American estimates were that 46,000,000 adults in the United States, an estimated 30%, have high blood pressure across all age groups 18-74 years, with prevalence approaching 50% in the elderly (Dahlof et al., 1991; Joint National Committee on Detection, Evaluation, & Treatment of High Blood Pressure, 1993).

Hypertension has been considered one of the most common chronic diseases in the elderly population with a prevalence in all industrialized countries approaching or exceeding 50% (Dahlof et al., 1991; Newfoundland

Department of Health & Department of National Health & Welfare, 1990). Lack of adherence to medication regimens has been identified as one of the significant reasons for poor control of hypertension (Morris & Schulz, 1992). This link between adherence to therapeutic regimens and control of hypertension has stimulated the proliferation of educational and counselling interventions to improve adherence. Over the last 25 years, adherence to antihypertensive regimens including diet, exercise and medications has been the focus of extensive research. The study of adherence to antihypertensive medications accounted for a large number of the studies. North American and European research has largely concentrated in two areas; measuring adherent behaviours and investigating methods of improving them. This study was one of the first to measure adherence to antihypertensive medications in Newfoundland and examine the factors influencing it in elderly Newfoundlanders.

Inconsistencies in definitions and methods of measuring adherence have lead to a wide range of research results. Various researchers have manipulated behaviour through experimental interventions such as teaching programs. The resulting changes in adherence were often inconsistent among studies. Roth (1987) in an extensive literature review of adherence, found methods of assessing medication adherence ranged from self reporting, pill counts, electronic monitoring, serum and urine screening, to clinician judgement.

The association among adherence to antihypertensive medications,

blood pressure control and mortality in the hypertensive population was often a missing link in the study of hypertension in the studies reviewed. Morris and Schulz (1992) conducted an extensive review of medication adherence. They found that non-adherence was identified with 23% of nursing home admissions, and up to 10% of hospital admissions. Nonadherence contributed to approximately 125,000 cardiovascular deaths and several thousand cardiovascular hospitalizations per year, and doubled the cost of treating moderate to severe hypertension (Morris & Schulz, 1992). Similarly, Dahlof et al. (1991) observed reduced mortality in an elderly sample up to 84 years treated with antihypertensive medications versus a hypertensive elderly group not treated with these medications. Adherence to these medications was not examined by Dahlof et al. (1991). The link between antihypertensive medication use and improved survival in the elderly should, however, be noted.

The elderly have not been the primary focus of many studies on adherence to antihypertensive medications before 1980. Studies that included the elderly often omitted participants older than 70 years of age, therefore omitting the "old old" population. Several studies, however, in the last decade have concentrated on the elderly population including the very old (Amery et al., 1986; Dahlof et al.. 1991; National High Blood Pressure Education Program Working Group, 1993; Perneger, Klag, Feldman, & Whelton, 1993; Systolic Hypertension in the Elderly Program Cooperative Research Group, 1991). Findings from these studies suggested

that treatment of hypertension in the elderly can lead to reduced mortality and morbidity of cardiovascular and cerebrovascular diseases. They also indicated that improving adherence to antihypertensive medications can lead to improved healthy outcomes.

Several conceptual models have been used to evaluate adherent behaviours. The Health Belief Model has been a conceptual model frequently used in assessing adherence to therapeutic regimens for patients with hypertension (Andreoli, 1981; Cronin, 1986; Haynes, 1979; Jones, Jones, & Katz, 1987; Lorenc & Branthwaite, 1993). The Model suggested that health beliefs influenced ones readiness to undertake a recommended behaviour. Other factors influencing adherent behaviour were collectively described as enabling and motivating factors (Becker, 1974). The Model has been used to study behaviours of patients with other chronic conditions, such as obesity and asthma; acute illness behaviours, such as following antibiotic therapy; and preventative health practices, such as breast self examination (Becker et al., 1979; Champion, 1984; Nemcek, 1990). The basic premise of this model was that health beliefs influenced adherent behaviours.

To date no studies have been found using the Health Belief Model to explain adherent behaviour in Newfoundland elderly with hypertension. Research using the model and testing the instruments used to measure health beliefs were primarily based on American and European studies where the design and delivery of health care were different from that of Canada. Results reported from these studies may not be relevant to the Canadian or

Newfoundland population.

Purpose of the Study

The purpose of this study was to measure the prevalence of adherence to antihypertensive medications and to determine if selected factors identified in the Health Belief Model were significantly associated with this adherence in a sample of Newfoundland elderly with hypertension.

Summary

Hypertension has been identified as a significant risk for the elderly in Newfoundland. One factor thought to influence hypertension is medication adherence. Adherence to medications has been considered a valuable and beneficial behaviour to promote healthy outcomes of care. The Health Belief Model has been identified as a acceptable model for the study of adherence to antihypertensive medication regimens. This study will examine the relationship between adherence to antihypertensive medication regimens and selected factors of the Health Belief Model.

CHAPTER II

Literature Review

Hypertension: Disease Profile

Primary hypertension has been recognized as a key risk factor for cardiovascular, cerebrovascular, and renal disease in the elderly in the previous chapter. Approximately 12% of the Canadian population were reported as 65 years of age or older (Gauthier, 1991). This population group will reach 21% by the year 2050 (Gauthier, 1991). The prevalence of hypertension was reported at 16% in the Canadian population and increased to 31% in the over 65 year old group (Statistics Canada, 1994). If the rate of hypertension remains constant in the elderly population the prevalence will, at least, double by the middle of the next century. Health care providers who care for the elderly with hypertension will therefore be required to have a sound knowledge of assessing and improving adherence to therapeutic regimens.

Adherence: Scope of the Issue

Adherence to therapeutic regimens has been a critical factor in the effectiveness of health promotion and disease treatment for patients with hypertension as well as other chronic illnesses (Mühlhauser et al., 1993; Rudd, Ramesh, Bryant-Kosling, & Guerrero, 1993). Issues influencing patients' decisions to follow health advice remained a major concern for health care providers today. Community based health care delivery systems and patient rights to independent decision making are under intense

discussion among the public, health care providers, and funders of health care. The shift away from institutional care has resulted in shorter length of stay in hospitals and more demands on community care givers, both professional and nonprofessional.

As the elderly population increased, the prevalence of chronic diseases and complexity of therapeutic regimens also increased. Medications played an important role in the management of illness in this age group. Steward, Moore, May, Marks, and Hale (1991) studied drug use patterns in an elderly population over ten years and found the average number of medications was 3.94 per person (excluding PRN's). Botelho and Dudrak (1992) reported an average of 4.73 medications per person in their study of elderly patients with chronic illness while Darnell, Murray, Martz and Weinberger (1986) found their elderly sample were taking an average of 4.5 prescribed drugs. Adherence to therapeutic regimens, particularly medications, may become the ultimate challenge of health care providers in the future.

Concept Definitions

Three major terms used in the literature to refer to the concept of following prescribed therapeutic regimens are: compliance, adherence, and therapeutic alliance. Barofsky (1978) suggested that all three refer to the process "whereby a patient assumes the various tasks that make up a therapeutic regimen" (p. 369). The term compliance, he concluded, implied that the patient had been coerced; adherence implied the patient was conforming to some norm or standard set for him; while therapeutic alliance

implied the patient had negotiated what it was he would do to care for himself (Barofsky, 1978). Blackwell (1976) used more operational definitions of adherence in his study of patients taking psychiatric medications. He defined adherence as conforming with a prescribed medication regimen including (a) taking medications for the correct reasons, (b) taking the correct dosage, (c) following the correct timing, (d) using proper mode of administration, and (e) not taking medications prescribed for others.

In studies which examined adherence to antihypertensive medications, the terms adherence and compliance were again used interchangeably; often with no clear conceptual or operational definition provided. The term compliance was more commonly used, however, in approximately 8000 English language articles published up to 1990 on the subject (Donavon & Blake, 1992).

Assessing Adherence

Accurately assessing adherence to medication regimens and making comparisons to other studies have been difficult as definitions and methods used varied considerably. Several studies examining adherence to antihypertensive medications have defined adherence in terms of numbers of medications taken versus number prescribed. Sackett et al. (1975) as well as Botelho and Dudrak (1992) defined nonadherence as using less than 80% of the prescribed medications. No upper limit was defined. Lorenc and Branthwaite (1993) considered respondents adherent if they were taking 90

- 110% of their prescribed medications. Hawe and Higgins (1990) defined severe nonadherence as taking 80% or less or 120% or more of essential medications prescribed to control a medical condition. Often studies using a pill count did not specify their exact adherence range.

Adherence to prescribed antihypertensive medications has been measured through a variety of methods. Pill counts, self reporting, urine and blood analysis, electronic monitoring, blood pressure monitoring, and researcher judgements, or a combination of these, have been techniques widely used for this purpose (Andreoli, 1981; DeVon & Powers, 1984; Hilbert, 1988; Isaac & Tamblyn, 1993; Kravitz et al., 1993; Morisky, Green, & Levine, 1986; Morris & Schulz, 1992). Assessment of pharmacy prescription refill information has also been used to evaluate adherence. Medications dispensed in liquid or ointment form may be more difficult to monitor than pills. Liquids, for example, may not always be measured with standardized devices. Antihypertensive medications have been primarily dispensed in pill format.

Inaccurate results have occurred with pill counts for a number of reasons. It was difficult to determine if the patient has actually taken the pills according to prescribed instructions if medications have been spilled, discarded, or shared with others (Westfall, 1986). The count has not indicated whether a pill was taken at the time or dose prescribed (Roth, 1987). The number of pills dispensed may sometimes be missing from the label of bottles (Hawe & Higgins, 1990). Lorenc and Branthwaite (1993)

concluded that one of the greatest problems with the study of long term medication use was accurately determining the starting date for use of the medication. Dates of filling prescriptions have not always coincided with the date the individual began taking the pills. Individuals may have picked up refills when it was convenient, long before their previous bottle was empty. Elderly persons have often depended on neighbours or relatives to pick up their prescription. They may not have risked running out of their pills in case no one would be available on the last day. It was possible, however, that several of these methodological concerns could have been overcome if long term assessment of medication behaviours was undertaken. Most research studies were confined to a short period of time which leads to increased risk of error in assessing adherence.

Other methods of assessing adherence, such as urine or blood analysis, electronic monitoring were not used in this proposed study but have offered varying degrees of accuracy (Morris & Schulz, 1992; Roth, 1987). Electronic monitoring, for example, could detect if a container has been opened, but could not prove if the medication was actually been taken. Urine or blood analysis might not account for possible variability of pharmacokinetic factors of different medications or individual differences (Morris & Schulz, 1992). Self reporting had generally shown the closest association with pill counts when patients have been nonadherent (Roth, 1987). Results from serum and blood analysis have also provided inconsistent results when compared to pill counts and number of

prescriptions filled (Morris & Schulz, 1992; Roth, 1987).

The combination of assessment methods, known as triangulation, added strength to findings if results were highly correlated (Polit & Hungler, 1991). By using multiple methods and perspectives "true information can be sorted out from 'error' information" (Polit & Hungler, 1991, p. 386). In this study, multiple criterion measures for the construct of adherence were used including pill count, examination of pill bottle labels, chart review, and structured interview questions.

Medication Adherence Rates

Medication adherence rates ranged from 33 to 94% across various studies of all age groups and patient diagnoses including elderly patients with hypertension (Coons et al., 1994; Morris & Schulz, 1992). Klein (1988), in a comprehensive literature review, found reports of 50-60% adherence to medication regimens across several studies. Lorenc and Brantiwaite (1993) observed that 26% of patients were taking more than 110% of prescribed medications while 53% were taking less than 90% of medications prescribed. Other researchers found 53% of the elderly reported taking their drugs according to the prescribed daily frequency and 65% of the elderly in the correct quantity (German, Lawrence, McPhee, & Smith, 1982; Klein, German, McPhee, Smith, & Levine, 1982). Kison (1992) as well as Miller, Johnson, Wikoff, McMahon, and Garrett (1983) and Miller et al. (1989) found 76% adherence to cardiac medications. Botelho and Dudrak (1992) found 54.7% of their elderly sample taking long term

medications were nonadherent.

Adherence to Antihypertensive Medications

Steward et al.(1991) reported that antihypertensive medications were the most frequently used drugs, accounting for 9.5% of all therapeutic drugs used in the elderly sample. Medications were identified as a antihypertensive treatment option in both The Newfoundland and Canadian Blood Pressure Studies where 80% and 87% of the participants, respectively, reported the use of antihypertensive medications to control their hypertension (Health & Welfare Canada, 1989; Newfoundland Department of Health & Department of National Health & Welfare, 1990).

Sackett et al. (1975), in one of the earliest studies of adherence to antihypertensive medications, reported that only 50% of the patients complied with at least 80% of their prescribed drug regimen. The Canadian Blood Pressure Survey reported 18% of those who had been on prescribed medication had discontinued its use. Among those who reported continuing to take their medications, 16% reported missing one or more pills in the week prior to the interview. Among those who discontinued, 40% did so because of their doctors' advise and 12% due to side effects (Health and Welfare Canada, 1989). Reasons why the remaining 48% discontinued were not provided. None of these studies were conducted specifically on elderly populations, however most included participants over 65 years old.

Factors Influencing Adherence to Medications

Demographic Factors. Findings of studies assessing the relationship

between demographic factors and adherence to medications have been mixed. While some studies found little correlation between age, gender, marital status, and educational levels and adherence to medications (Cooper, Love, & Raffoul, 1982; Craig, 1985; Klein et al., 1982; Lorenc & Branthwaite, 1993; Maddock, 1967; Nyamathi & Shuler, 1989; Owen, Friesen, Roberts, & Flux, 1985) others (Darnell et al.,1986) found a significant correlation for gender and medication adherence. Furthermore, Haynes, Sackett and Taylor (1979) reviewed 89 studies of adherence to medications, diet, and keeping return appointments of patients with a variety of health problems. Eighteen of these studies showed a significant negative correlation between increasing age and adherence. Seven studies found a significant positive correlation between age and adherence meaning adherence improved with age, while 64 studies examined showed no relationship between these variables. The mixed above results may have been due to a combination of factors such as different definitions of adherence, different samples, or different methods of assessing adherence.

Diagnosis and Regimen Complexity. There was no correlation identified between a number of medical diagnosis and predictions of adherence to medication regimens (Cooper et al., 1982; Lundin, Eros, Melloh, & Sands, 1980). The relationship between regimen complexity and medication adherence showed mixed results. Conn, Taylor, and Kelley (1991) evaluated the concept of complexity of regimens using the Medication Complexity Index "which measures number, frequency, and

types of actions required to enact a medication regimen" (p. 231). They compared adherence to medication regimens and regimen complexity and the results were not statistical significance (Conn et al., 1991). Isaac and Tamblyn (1993) also found no relationship between medication adherence and regimen complexity. Other researchers found a significant decrease in medication adherence as frequency of daily drug administration increased (Darnell et al., 1986; Murray, Darnell, Weinberger, & Martz, 1986). Parkin, Henney, Quirk, and Crooks (1976) found nonadherence was significantly related to the number of drugs prescribed. More specifically, adherence was reduced significantly when more than three medications were taken.

The length of time taking a medication regimen was not examined in the fore mentioned studies as part of the analysis of regimen complexity in chronic illness. Lorenc and Branthwaite (1993) compared adherence to short term versus long term medication regimens. There was no significant difference between the groups.

Examination of the interaction of multiple factors may be valuable. It is unlikely that single identifiable factors will account for all adherence behaviours, rather a complex combination of multiple interactive forces.

Support Systems. Family support and other support systems have been found to be an important factor in influencing patients to maintain long-term adherence to their medications (Levine et al., 1979; Miller, Johnson, Garrett, Wikoff, & McMahon, 1982). Methods used to evaluate social support varied in these fore mentioned studies but generally a structured

questionnaire was completed by both patients and family members. Lorenc and Branthwaite (1993) also found a statistically significant improvement in adherence for participants living with a relative versus those who were not. DiMatteo and Hays (1981) reviewed a number of studies where greater family support was associated with reduced adherence to therapeutic regimens. The complexity of defining and evaluating support systems may have contributed to the inconclusive findings in this area.

Socioeconomic Status. Studies of correlations between socioeconomic status and adherence to medications have revealed inconsistent findings. Cooper et al. (1982) and Maddock (1967) found no correlation between adherence and socioeconomic status while others found significant positive correlations (Nyamathi & Shuler, 1989). Coons et al. (1994) found a significant negative correlation ($p < .01$) between level of income and adherence.

Cardiovascular mortality rates for seniors with high income levels were reported to be 47% less than those with lower income levels in males and 53% less in females (Health and Welfare Canada, 1989). Further research is needed, however, to determine if any true significant association exists between adherence and cardiovascular mortality rates. Investigations of disease prevalence or disease severity may also be more appropriate measures to compare with socioeconomic status.

Knowledge Level. Some studies found no correlation between medication knowledge and adherence (Klein et al., 1982; Lundin et al.,

1980) while others did (Lorenc & Branthwaite, 1993). Cooper et al., (1982) found that 70% of the non-adherence was intentional in their sample group suggesting that attitude rather than knowledge may have a greater influence on adherent behaviours. The major reason identified was the patient's perception that the drug was not needed in the dosage prescribed. Experimental studies which manipulated knowledge levels through educational programs generally demonstrated improvement in adherence at the end of the experimental period (Gien & Anderson, 1989; Hammanlund, Ostrom, & Kethley, 1985; Harper, 1984; Hecht, 1974; Levine et al., 1979; Lundin et al., 1980; Opdycke, Ascione, Shimp, & Rosen, 1992).

None of the studies reviewed were conducted solely on elderly hypertensive populations. Improvements in adherence to medications in most studies were often for a short term duration of six months or less. Longer term gain, greater than one year for example, was seldom evaluated. Three studies, however, measured the change in level of adherence one year after the intervention. One showed a diminutive effect (Harper, 1984), two (Gien & Anderson, 1989 ($p<.01$); Levine et al., 1979 ($p<.001$) found improved medication taking behaviours still significantly different from the control group one year after intervention.

Studies conducted on hypertensive clients receiving education on medications have revealed conflicting results. Sackett et al. (1975) found no change in adherence rates six months following implementation of an education program for hypertensive male steel workers ($N=230$). Haynes et

al. (1976) reported, however, a 21% increase in adherence in a similar but smaller group (N=38) using various close supervisory techniques such as clinic visits every two weeks, praise and encouragement for any reductions in blood pressure, and a small monetary stipend of four dollars toward a home blood pressure monitoring kit. Reasons for missed pills were investigated and solutions sought. Neither of these studies of hypertensive subjects included elderly participants. The inconsistent findings noted in these previously discussed studies may have been attributed to differences in the design and delivery of the educational program, the content of the program, or the demographic characteristics of the samples.

Information giver. Edwards and Pathy (1984), in a comparison study of education groups conducted by a nurse, a pharmacist, and a physician found minimal differences between adherence level of the groups. Ramsay, McKenzie, and Fish (1982) in a comparison study of nurse practitioner and physician clinic attendance also found no adherence differences between groups. Groups receiving education, in general, revealed a statistically significant improvement in adherence over control groups (Edwards & Pathy, 1984). It was unlikely that the professional status of the care giver was the determining variable rather the nature of the relationship between health professional and the participant.

Patient education provided by health care professionals was often viewed by researchers as a type of social support. Lundin et al. (1980) contended that the nurse is the most consistently available professional.

Nurses involved in patient education must not only be concerned with the accuracy and clarity of the information given to patients but also on the support given in the process. Recent investigations suggested that combining educational and behavioral strategies have the greatest positive effect on adherence (Morris & Schulz, 1992).

Mental Status. Conn, Taylor and Miller (1994) reported that the incidence of cognitive impairment in community residing older adults ranged from 3%-20% as measured by a mental status questionnaire. They found no correlation, however, between adherence to medication regimens and moderate impairment of mental status as did Botelho and Dudrak (1992). Isaac and Tamblyn (1993) found mental status was moderately correlated with medication adherence however it was in the negative direction; lower score on the Mental Status Exam was related to higher adherence. The authors did not indicate if this relationship was significant. Health care professionals cannot, therefore, "assume that standard tests of cognitive function will detect older patients who will have difficulty with medication" (Conn et al., 1994, p.46).

Summary

Findings, in general, revealed approximately 50% of those who took antihypertensive medications were actually adherent to the prescribed regimen across various diagnosis and age groups. No relationship has been identified between adherence to medications and gender, marital status, educational levels of participants, and duration of hypertension. A wide

variety of factors investigated in relationship to adherence to medications have demonstrated an inconclusive correlations. These included age, socioeconomic status, mental status, regimen complexity, and knowledge level. Studies generally supported the idea that social support and educational strategies enhanced adherence to medication regimens. As most studies did not focus particularly on elderly participants with hypertension, it was unknown if the findings were generalizable to this sample. No research studies on adherence in Newfoundland elderly had been identified to date. This study therefore is proposed to assess factors influencing medication taking behaviours of a sample of elderly Newfoundlanders with hypertension.

CHAPTER III

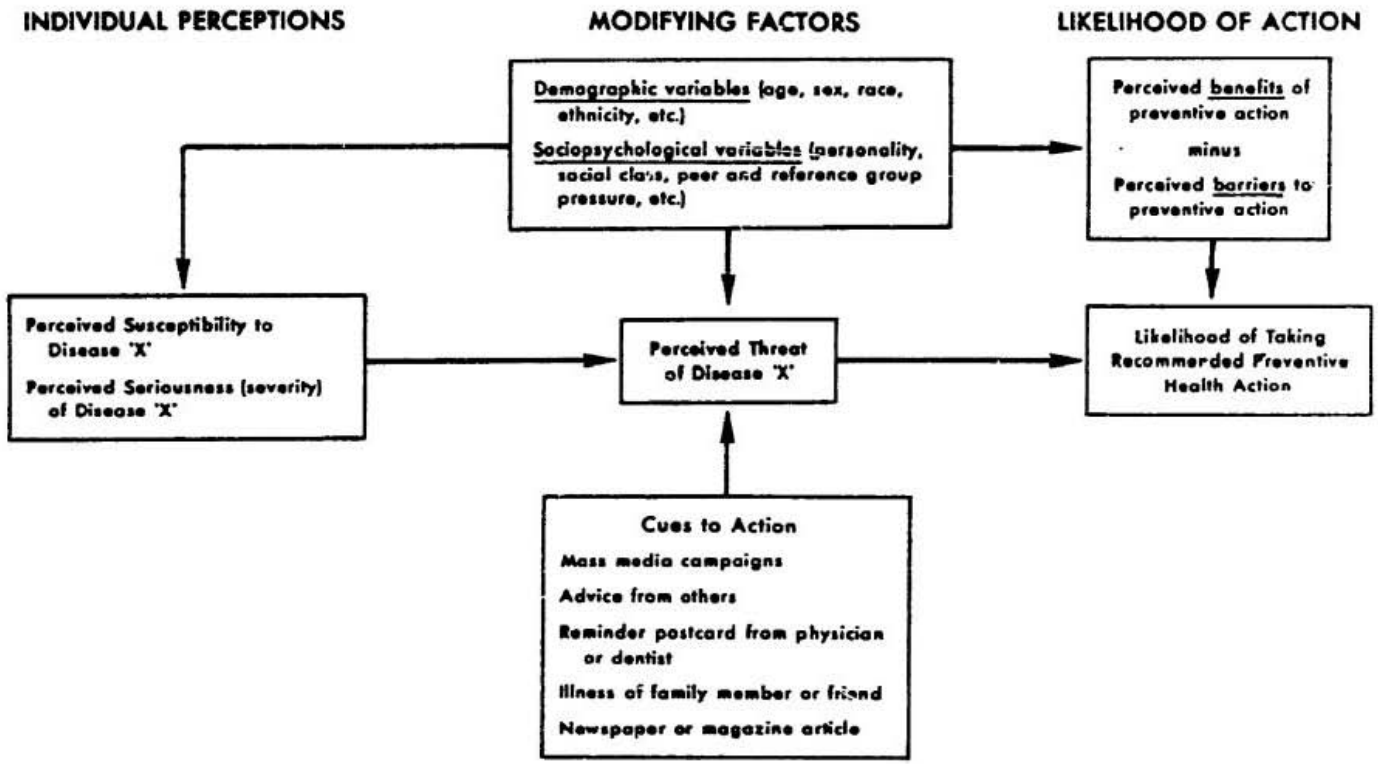
Conceptual Model for the Study of Adherence

Health Belief Model: Overview

The Health Belief Model had its origins in the 1950's based on the work of social psychologists at the United States Public Health Service (Becker et al., 1979). It was developed to predict the likelihood that individuals would follow recommendations to partake in preventative health actions, such as immunization and tuberculosis screening (Becker et al., 1979). The model has since been revised to explain adherence to therapeutic regimens in chronic illness (Redeker, 1988).

The original model specified several dimensions which were theorized to influence adherence behaviour (Janz & Becker, 1984). These included a number of beliefs that were felt to influence readiness to undertake the recommended health behaviour as well as modifying factors including demographic variables and cues to action such as education, advice, or past family illness experiences (Becker, 1974; Becker et al., 1979). The original model included four beliefs; perceived susceptibility (or resusceptibility); perceived seriousness (severity); perceived benefits; and perceived barriers (Figure 1).

1. Perceived susceptibility (or resusceptibility) described the degree to which an individual perceived and personalized their risks of suffering ill effects from existing illness. It addressed the degree to which an individual felt personally vulnerable to the condition and its effects on the person. It



From: "Patient perceptions and compliance: Recent studies of the Health Belief Model" by M. H. Becker, L.A. Maiman, J.P. Kirscht, D.P. Haefner, R.H. Drachman, and D.W. Taylor. In R.H. Haynes, D.W. Taylor, and D.L. Sackett (Eds.), (1979). Compliance in Health Care. p. 79. Baltimore, New Jersey : Charles The John Hopkins University Press.

Figure 1
Original Health Belief Model

was an assessment of one's subjective perception of contracting or reactivating a medical condition.

2. Perceived seriousness (severity) was concerned with how threatening the condition was to the person's wellbeing. "This dimension included evaluations of both medical/clinical consequences (eg., death, disability, and pain) and possible social consequences (eg., effects of the condition on work, family life, and social relations)" (Janz & Becker, 1984, p. 2).

3. Perceived benefits related to the anticipated feasibility and efficacy of the treatment regimen and medical care in preventing or reducing susceptibility and/or severity of the condition (Janz & Becker, 1984). An individual would have to feel the benefits for adhering with the regimens outweighed the barriers, inconveniences, and any negative consequences. These included medical benefits of medication, diet, lifestyle changes or other therapeutic regimens.

4. Perceived barriers included the anticipated negative aspects of the recommended behaviours (Becker, 1974; Maiman, Becker, Kirscht, Haefner, & Drachman, 1977; Weissfeld, Kirscht, & Brock, 1990). A cost-benefit analysis was thought to occur where the individual analyzed the positive outcomes of following the regimen and compared them to the negative aspects such as side effects, costs, or difficulty.

The model was refined for assessing adherence in chronic illness behaviour in 1974. Figure 2 describes the new model, including its

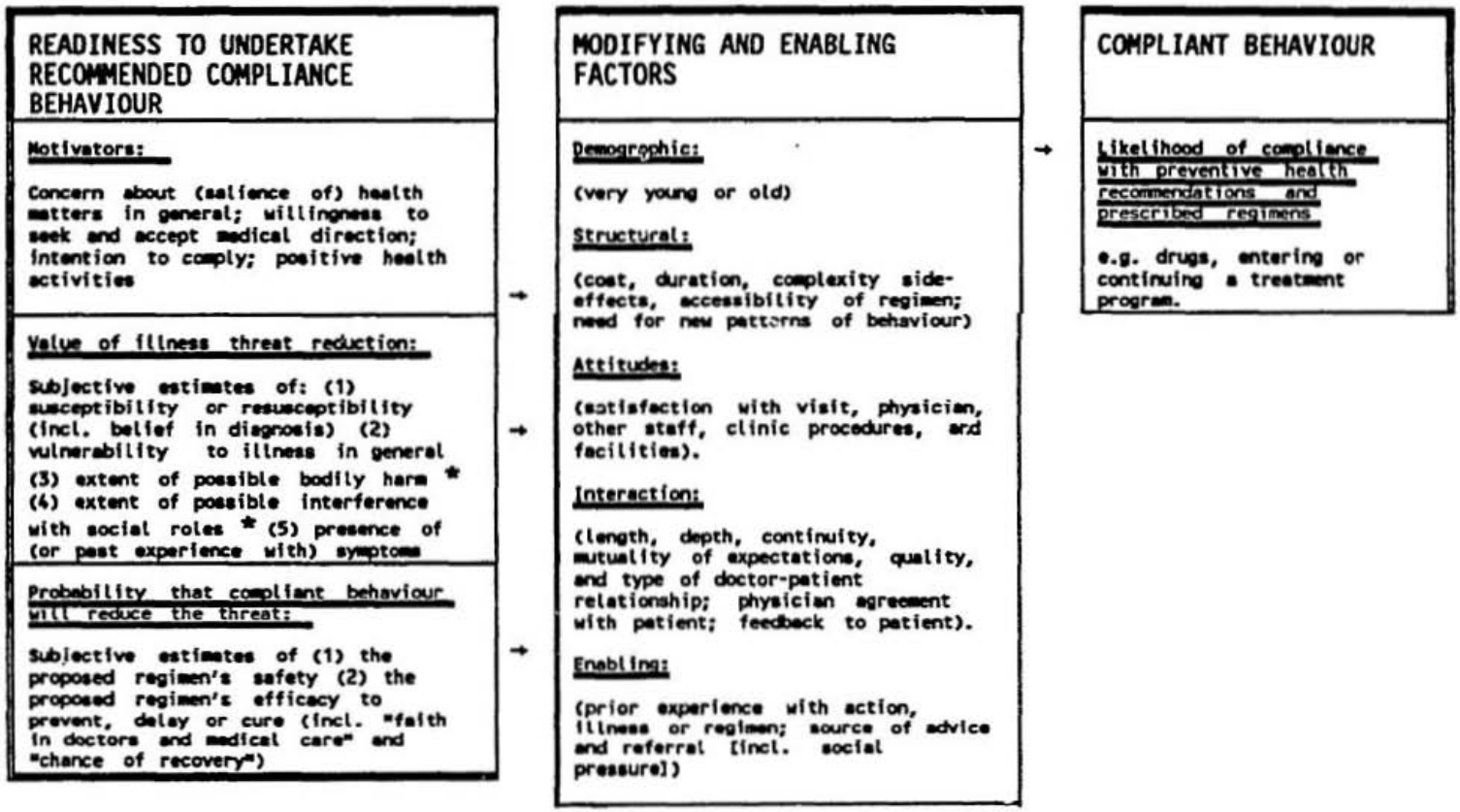
components and the relationships between variables. The original elements of the model were maintained with the four previous beliefs being refocused into three main areas of belief identified collectively as "Readiness to undertake recommended compliance behaviour" (Becker, 1974, p. 89). These included motivators, value of illness threat and probability that compliant behaviour would reduce the threat of the condition.

1. Motivators included health concerns which focused on the individual's judgement about the impact of the condition on one's well being. An individual's high level of concern about health status was considered a motivator. This could be demonstrated by willingness to seek and accept health advice, intention to adhere to the recommended regimen, or exhibiting positive health behaviours.

2. Value of illness threat addressed perceived health threats the individual attributed to a disease. Beliefs concerning susceptibility and resusceptibility to a condition, vulnerability to illness in general, risk of possible bodily harm, risk of interference with social roles, and present or past experience with symptoms were included in this category (Becker, 1974).

3. Probability that compliant behaviour will reduce the threat addressed the benefits and barriers the individual perceived that the compliant behaviour would affect the health threat of the illness. This included estimates of the safety of the regimen and its perceived efficacy.

The health beliefs identified in the model were recognized as



* At motivating, but not inhibiting levels.

Modified from: "The Health Belief Model and sick role behaviour" by M. H. Becker. In M. H. Becker (Ed.), (1974). The Health Belief Model and personal health behaviour. p. 89. Thorofare, New Jersey : Charles B. Slack, Inc.

Figure 2
Modified Health Belief Model

"accounting for as much of the variance in individuals health-related behaviour as can be explained by their attitudes and beliefs" (Becker, 1974, p. 544). The developers of the Health Belief Model acknowledged, therefore, that beliefs alone do not account for all health related behaviours (Becker, 1985, Janz & Becker, 1984). Becker et al., (1979) concluded that "health beliefs, instead of preceding and determining compliant behaviour, develop along with compliance behaviour as a result of experience with treatment gained by patients in the early weeks or months of therapy" (p. 108).

The role of other factors which influence adherent health behaviours was reflected in the model by incorporating variables felt to modify either positively or negatively the adherent behaviour. These were categorized as modifying and enabling factors (Figure 2). They included (a) demographic factors; (b) structural issues such as cost, duration, and side effects of the recommended behaviour; (c) attitudes towards care givers, clinic procedures and facilities; interaction issues such as length and depth of doctor-patient relationship; and (d) enabling factors such as prior experience with illness and social pressure. Beliefs as well as modifying and enabling factors could operate either positively or negatively on the desired adherence behaviour (Becker, 1974).

The study of interrelations between components of the model has primarily focused on either measuring beliefs in a designated population or demonstrating relationships between beliefs or enabling and modifying

factors with adherence to a predetermined health behaviour in this group. No studies were identified which examined correlations between health beliefs. It was not the intention of this study to examine such correlations.

Methodological issues associated with health belief research included the wide variety of scales to measure belief constructs and adherence, lack of valid and reliable belief instruments, and the necessity of developing a new instrument for each condition (Redeker, 1988). Although the model was significantly revised in 1974, instruments continued to focus on traditional isolated health belief scales rather than on assessing the three new collective areas of beliefs; motivators, value of illness threat, and probability that compliant behaviour will reduce threat (Figure 2). Blood pressure control was used by some researchers to operationalize adherence (Andreoli, 1981; Cronin, 1986; DeVon & Powers, 1984). A self reporting instrument was used by others (Cronin, 1986; Hawe & Higgins, 1990; Kison, 1992). Lorenc and Branthwaite (1993) used a pill count technique. Caution in the interpretation and comparison of results across studies must therefore be observed.

Health Belief Model and Adherence

Health Beliefs and Adherence to Antihypertensive Medications

The Health Belief Model has been used with hypertensive patients to study adherence to therapeutic regimens such as medications, diet, exercise, and keeping clinic appointments (Andreoli, 1981; Cronin, 1986; DeVon & Powers, 1984; Jones et al., 1987; Sackett et al., 1975). Weissfeld et al.

(1990), studied the relation between beliefs, demographic factors and health status finding that "sociodemographic markers of social disadvantage...appeared to associate with favourable health beliefs" (p. 141). While none of these studies were conducted specifically on elderly populations, most included participants over 65 years old. The model supported the premise that if beliefs and perceived benefits of therapy were high and barriers were low, adherence should be high.

Some of the beliefs identified in the Health Belief Model have been shown to significantly influence adherence to antihypertensive medications while others have not. Researchers have generally selected isolated elements from the model and tested their strength of association with adherence to antihypertensive medication. A summary of these research findings were presented in Table 1.

Lorenc and Branthwaite (1993) found medication adherence in chronic illness was significantly associated with beliefs about medical benefits such as the importance of tablet taking and length of time waiting to see doctor. They found however, that general health concerns in chronic illness, assessed as fear of the illness, adversely affected adherence. This finding was contrary to the assumption of the Health Belief Model that fear, at motivating but not at inhibiting levels, would increase concern about the illness therefore enhancing adherence (Lorenc & Branthwaite, 1993). These researchers did not indicate if the fear measured was determined to be at motivating level. The sample was comprised of participants with multiple

health problems. The majority of the group (67%) were over 70 years old.

The sample and methods used to measure adherence and health beliefs were not consistent across studies making comparisons often difficult. All studies included adults of all age groups, however the source of the sample varied. Samples were identified from an emergency room, pharmacy dispensing records, a family practice service, an internal medicine

Table 1

Studies Assessing Relationship Between Health Beliefs and Adherence to Antihypertensive Medications

Health Belief	Study	Results
General Health Concern	Lorenc & Branthwaite (1993)	Significance ($p = .022$)
General Health Threat	no studies identified	
Susceptibility	Cronin (1986) Andreoli (1981) Kirscht & Rosenstock (1977)	no significance no significance Significant ($p < .05$)
Medical Benefits	Cronin (1986) Andreoli (1981) Kison (1992) Lorenc & Branthwaite (1993) Kirscht & Rosenstock (1977)	no significance no significance significant ($p = .10$) significant ($p = .000$ and .009) Significant ($p < .05$)
Severity	Cronin (1986) Andreoli (1986)	no significance no significance

practice, a cardiac rehabilitation program, and a Veterans Hypertension Clinic (Andreoli, 1981; Cronin, 1986; DeVon & Powers, 1984; Jones et al., 1987;

Kison, 1992; Lorenc & Branthwaite, 1993). The severity of disease would most likely vary from those seen in a family practice service versus an internal medicine practice or a Hypertension Clinic.

Adherence was measured differently among studies. Blood pressure recordings were used to differentiate adherent from nonadherent participants in two studies (Andreoli, 1981; Cronin, 1986), judgement of two internists was used in another (DeVon & Powers, 1984) and a pill count or self report was used by others (Botelho & Dudrak, 1992; Kison, 1992; Lorenc & Branthwaite, 1993). Health beliefs were measured with several tools including those developed by the investigator (Andreoli, 1981; Lorenc & Branthwaite, 1993; Weissfeld et al., 1990) and others adopted or modified from other researchers (Cronin, 1986; DeVon & Powers, 1984; Kison, 1992).

The diversity of samples, instruments and methods used may have attributed to the lack of consistency in results discussed above. The Weissfeld, Kirscht, and Brock Health Belief Scale (Weissfeld et al., 1990) chosen for use in this study had not been used to compare adherence to antihypertensive medications with health beliefs. Each subscale in the questionnaire related to a dimension of the Health Belief Model (Figure 2). General Health Concerns were related to the motivators component of the model; General Health Threats and Susceptibility related to the value of illness threat reduction; and Medical Benefits to the probability that compliant behaviour will reduce the threat. Empirical testing of components

of the model has continued to challenge researchers in an attempt to measure health beliefs and accurately predict their influence on sick role behaviours.

Modifying and Enabling Factors

The modifying and enabling categories identified in the Health Belief Model included: (a) demographic variables such as age, gender, marital status, and educational levels; (b) structural items such as duration of illness, accessibility of the regimen, complexity of regimen; (c) patient attitudes toward care givers; (d) quality of the interaction, length, continuity, feed back to patient; and (e) enabling issues such as knowledge level, prior experience with action, illness or regimen (Figure 2). These results were discussed in detail in the previous chapter and were briefly highlighted in the context of the Health Belief Model in Table 2. Correlations of adherence to antihypertensive medication regimens with enabling and modifying factors such as demographic and structural variables, have shown some significant relationships however with some inconsistencies across studies. Conflicting results were evident in the relationship of adherence to antihypertensive medications and interaction variables identified in the model (Figure 2). Education programming, a commonly used experimental intervention, generally resulted in short term gains in adherence measured from one to six weeks after the program. Long term impact over one year was cited in some studies (Gien & Anderson, 1989; Levine et al., 1979).

Table 2

Studies Assessing Relationship Between Modifying and Enabling Factors of the Health Belief Model and Adherence to Antihypertensive Medications

Modifying and Enabling Factors	Study	Results
Demographic Factors	Cooper et al.(1982)	no significance
	Craig (1985)	no significance
(Age, Education, Income,	Haynes et al.(1979)	no significance
Gender, Marital Status,	Klein et al. (1982)	no significance
Income)	Lorenc & Branthwaite (1993)	no significance
	Maddock (1967)	no significance
	Nyamathi & Shuler (1989)	no significance
	Owen et al. (1985)	no significance
	Coons et al. (1994)	significant ($p<.01$) income
	Darnell et al. (1986)	significant ($p=.006$) gender
Structural Factors		
Disease diagnosis	Cooper et al. (1982)	no significance
	Lundin et al. (1980)	no significance
Number of diseases	Coons et al. (1984)	no significance
Complexity of regimen	Conn et al. (1991)	no significance
	Isaac & Tamblyn (1993)	no significance
	Botelho & Dudrak (1992)	no significance
	Coons et al. (1994)	Significant ($p<.01$)
	Darnell et al. (1986)	Significant (N\A)
	Murray et al. (1986)	Significant ($p<.05$)
Quality of interaction	Levine et al. (1979)	significant (p=N\A)
Family support	Lorenc & Branthwaite (1993)	significant ($p=.000$)
	Miller et al. (1982)	significant ($p<.01$)
Enabling factors	Lorenc & Branthwaite (1993)	significant ($p=.004$)
Medication knowledge	Klein et al. (1982)	no significance
	Lundin et al. (1980)	no significance
	Sackett et al. (1975)	no significance
	Haynes et al. (1976)	significant ($p<.001$)
	Glen & Anderson (1989)	significant ($p<.01$)
	Hammanlund et al. (1985)	significant ($p<.001$)
	Harper (1984)	significant ($p<.05$)
	Hecht (1974)	significant (p=N\A)
	Levine et al. (1979)	significant ($p=.001$)
	Opdycke et al., (1992)	significant (p=N\A)
	Sidel et al. (1990).	no significance
Attitude toward care giver-patient relationship	no studies identified	

The three variables found in the Health Belief Model that offer the most supportive data as influencing adherence were Medical Benefits Health Beliefs, education, and family support. Support for most other variables has been weak with a number of areas only scarcely explored or untested all together.

Summary

The Health Belief Model was examined as a plausible model for the study of adherence to antihypertensive medications. The Model has been widely used as a foundation for the study of adherence to antihypertensive therapeutic regimens with inconclusive findings to date. Studies which focused on adherence to antihypertensive medications in the elderly accounted for a small number of the studies. No study has been identified that examined the elderly Newfoundland hypertensive population. Difficulty arose in comparing results across several studies as data collection instruments and research methods varied from one study to another with no replication studies identified.

CHAPTER IV

Rationale and Objectives of Study

Rationale for the Study

Previous studies of adherence to antihypertensive medication regimens have not provided a conclusive understanding of the behaviour. Research results have continued to provide conflicting findings. The Health Belief Model has provided some explanation of adherent behaviour yet research is needed to further empirically validate its premises. The applicability of the model to study an urban elderly population in Newfoundland has not been tested. The model was chosen, therefore, to examine its potential use in understanding adherent behaviour in this population.

This research study tested the strength of the relationship between adherence to antihypertensive medications and ten selected variables in the model, including four health beliefs, four demographic variables, and two structural variables. These ten variables included beliefs of General Health Concerns, General Health Threats, Medical Benefits, Susceptibility; demographic factors of age, sex, education, and income; and structural factors of duration of hypertension and length of time on antihypertensive medications.

Definition of Terms

The following terms are used throughout the study and are defined below:

Adherence - "the process whereby a patient assumes the various

tasks that make up a therapeutic regimen... conforming to some norm or standard set for him" (Barofsky, 1978, p. 369). The operational definition of adherence for the purpose of this study will be further discussed in the next chapter.

Hypertension - consistent diastolic blood pressure equal to or greater than 90 mm Hg over three or more occasions with or without being on medication, salt restriction or weight reduction (Health & Welfare Canada, 1989; Newfoundland Department of Health & Department of National Health & Welfare, 1990).

Independent and Dependent Variables

The dependent variable in this study was adherence to antihypertensive medications. It was measured through a combination of methods including chart review, patient interview, examination of pill bottles, and a pill count. Details of this assessment will be discussed further in the next chapter on the design and methods of the study. The independent variables were the ten factors previously identified from the Health Belief Model. These were assessed by a face to face guided interview in the participant's home using a structured questionnaire.

Research Questions

The study attempted to answer the following research questions:

1. What is the prevalence of adherence to antihypertensive

medication regimens in this convenience sample of Newfoundland elderly?

2. What are the patterns of adherence to antihypertensive medication regimens in this sample?

3. Is there a significant relationship among four selected health beliefs identified in the Health Belief Model and antihypertensive medication adherence?

4. Is there a significant relationship between selected modifying and enabling factors identified in the Health Belief Model with adherence to antihypertensive medications?

5. Is there a significant relationship between adherence to antihypertensive medications and mean diastolic blood pressure at the time of the interview?

Summary

This chapter has provided the rationale for the current study based on the previous review of relevant research on both adherence and the Health Belief Model. The independent and dependant variables were introduced and the research questions were outlined. The next chapter will outline the design and methods used in this study.

CHAPTER V

Design and Methods

Research Design

This study used a descriptive correlational design. It examined four beliefs associated with the Health Belief Model: General Health Concerns, General Health Threats, Susceptibility, and Medical Benefits. The association among these four variables and adherence to antihypertensive medications was retrospectively examined. The association between other Health Belief variables and adherence to antihypertensive medications was examined, including demographic and structural factors such as age, sex, income, education, duration of hypertension, and length of time taking antihypertensive medications. These were was also determined through the structured interview. Data were collected through a one time visit to the participant's home using a convenience sample of patients attending a Family Practice Clinic of a teaching hospital in St. John's, Newfoundland.

Sample Selection

Selection Criteria

The participants in the study were selected when they met all of the following inclusion criteria:

1. 65 years of age or older as of December 31st. of the year prior to the interview.
2. diagnosed of primary hypertension for at least one year prior to study as confirmed by the family physician.

3. prescribed antihypertensive medications and be responsible for self administration of medication.

4. understand English and have no sensory or cognitive impairment that would prevent the person from completing the interview as deemed by the family physician.

Selection Process

After receiving the approval of the Human Investigation Committee (Appendix A), the Chairperson of the Department of Family Practice was approached to obtain permission to conduct research within the department (Appendix B). This practice has one clinic based in an acute care centre, one in a long term care centre and one in a community centre. A computerized patient registration data base was available for part of the service. The Director of Research and Development in the Family Practice service assisted in securing a computer list of patients who were over 65 years and diagnosed with primary hypertension for the clinic at the acute care centre. The list was reviewed by the Director of Research and Development. This list contained 181 potential names. Each individual physician was asked by the researcher to participate in the study if any of their patients were on the computer list (Appendix C).

Closer analysis revealed that a large number of the names identified on this list were not eligible for the study for a number of reasons; living in nursing and personal care homes; no longer visiting the clinic; and deceased. A total of 33 participants who met the inclusion criteria for sample selection

were ultimately interviewed from this list. Five additional participants were identified by asking physicians if any other patients in their practice fit the criteria. A total of 38 respondents from the family practice clinic at the acute care centre were identified.

Computer records were not available in the community clinic and at the clinic in the long term care centre. There were 11 potential patients identified at the clinic in the long term care centre by reviewing the clinic lists for the previous four months with the physician and the receptionist. Eligible patients were identified through the memory of both. Three patients refused to participate. The receptionist reviewed clinic schedules at the community clinic and developed a list of potential participants. Approximately 10 potential patients were identified however only five were eligible once their charts were reviewed by the physician. All agreed to participate.

Reasons for exclusion from the study are provided in Table 3. Although eligible, physicians requested that patients who had not visited the clinic in over one year, not be included. These patients may have been deceased, chosen to change doctors, or not come for other reasons. Their privacy may therefore be violated by approaching them from the clinic. Deceased patients and those not visiting for more than one year were grouped together in Table 3 as physicians sometimes did not know if a patient had died or just stopped coming. The characteristics of this latter group are unknown. Nonadherence with clinic appointment may have been

associated with nonadherence to antihypertensive medications as another sick role behaviour (Becker, 1985).

Some patients were identified on the computer print out as being hypertensive but they were found not to be when physician reviewed the chart.

Table 3:

Reasons for Exclusion from the Sample

Reason for Exclusion	Number of cases	Percentage
Nursing Home/ Personal Care Home Resident	28	18.7%
Deceased or no GP visit for more than 1 Year	65	43.3%
No chart located or physician left	27	18%
No medications/not hypertensive	18	12%
Not competent to participate	3	2%
Refused	9	6%
Due to poor health	2	
Reason unknown	7	
Total excluded	150	100%

This may have been due to coding error. Of those who met inclusion criteria and were approached from all three sites, however, only nine patients (4.4%) refused to participate. This high participation rate reduces the nonparticipant bias from affecting the outcomes (Polit & Hungler, 1991). A final sample of 51 participants was obtained from the service of physicians in the Family Practice Department including the three sites: clinic in the acute care centre (n = 38), community clinic (n = 5), and the clinic in the long term care centre (n = 8).

Permission to contact patients and access to the medical charts was obtained from the physicians of the Family Practice Units once eligible patients were identified from the appropriate lists. Physicians made the initial contact by sending a letter describing the study (Appendix D) and encouraging their participation. The clinic receptionist then made follow-up phone contact to each potential participant to ascertain whether the individual was willing to participate or if a further explanation of the study was needed. Verbal consent was obtained from each individual by the receptionist before the researcher made contact. Admission to the study was totally voluntary. At the community clinic the potential participants were asked to participate through a telephone call as there is a high rate of illiteracy in this age population in the area. The public health nurse, who has her office at the clinic, made the phone calls to the five potential participants and all agreed to join the study.

The researcher made an appointment to visit the individual's home

after the initial verbal consent was secured. After the study was again explained, written consent (Appendix E) was obtained at the start of the interview. Only one potential subject withdrew consent when contacted to arrange an interview. One other potential subject gave initial telephone consent to the receptionist but was not able to be reached to arrange the interview. A total of 51 interviews were therefore conducted. If more than one person were eligible and agreeable to enter the study in a household, they were interviewed separately.

Several methods, as described above, were employed to ensure participants were fully informed prior to participating in the research. The elderly should receive extra consideration in ensuring informed consent (Wicclair, 1993). The principle of voluntarism, felt to be more vulnerable in this age group, was enforced (Wicclair, 1993). This was emphasized in this study by stressing at each point that the individual could refuse participation and withdraw from the process at any time.

Normal aging processes may have affected hearing, vision, comprehension or memory although loss of competency is not a presumed process of aging (Wicclair, 1993). Older persons may also process verbal information more slowly than younger subjects (Salisbury, 1991). Extra attention was paid to sitting on the side of the participant to allow optimal hearing, using a well lit and quiet room, slowly reading out all parts of the guided interview questionnaire including the choice of answers after every question. These measures improved the opportunity to collect accurate

information by ensuring a good understanding by the participant. Respondents were asked to choose the most correct answer from the appropriate scale. The questions and response options were repeated as needed to assist participants understand the questions clearly but the wording was not altered. A large print cue card with the options for each question was also provided. Literacy problems were minimal as reflected in the high overall educational levels found in the sample.

Interview Setting

Interviews were conducted in the client's residence between January 1993 and May 1994. It was anticipated that conducting the interview in the respondent's home would enhance feelings of security and comfort for the client. This was also the setting where their medication taking practices were carried out and the most likely setting to accurately access medications owned by the participants. It was anticipated that the privacy of the home setting would provide a quiet familiar environment. This was an important consideration for the elderly who may experience confusion in unfamiliar and noisy surroundings (Salisbury, 1991). Many research studies reviewed used clinical settings such as hospitals, outpatients, or physician offices. In this study, interviewing was done in participants homes which was felt to be the more natural setting to investigate subjective issues such as health beliefs.

The interview lasted 40-60 minutes. Instruments were administered in order of those listed in Appendix F to Appendix H. Two blood pressure measurements were taken; one in the sitting position, after completing the

Modified Weissfeld, Kirscht, and Brock Health Belief Scale and the other at approximately 30-40 minutes later after completion of all interview questions. Recommendations outlined by Campbell, Chockalingam, Fodor, and McKay (1990) were used for measuring blood pressure. The sitting position was used as it was the natural position participants were in during the interview. The left or right arm was chosen arbitrarily for the first measure. The second measure on each patient was always taken from the same arm where the first blood pressure measurement was taken. The time lapse between blood pressure measures allowed the respondent to adjust to the presence of the researcher and reduce anxiety that may falsely elevate the blood pressure.

Instruments

Data were collected from participants using a variety of sources (Appendices F-H); chart review, examination of pill bottles, pill count, guided interview questions using structured questionnaires, and auscultatory measurement of blood pressure with a mercury sphygmomanometer. The methods of data collection will be discussed including their advantages and disadvantages and efforts taken to overcome limitations of each.

Weissfeld, Kirscht, and Brock Health Belief Scale

A modification of the Weissfeld, Kirscht, and Brock Health Belief Scale (Appendix F) was used to collect data measuring the four components of the Health Belief Model (Weissfeld et al., 1990). The scale was used to answer research question three: Is there a significant relationship among four

selected health beliefs identified in the Health Belief Model and adherence to antihypertensive medications?

The original instrument (Appendix J) consisted of a series of six scales which collectively assessed components of the Health Belief Model in a hypertensive population. The scale was designed for use as part of an extensive research tool administered by personal interview in a Michigan blood pressure study using a sample of 2802 persons over the age of 18 years. Approximately 20% of the sample were over the age of 60 years. In the original study, research scores obtained in the interview were reversed in the analysis so that high scores meant higher beliefs (J. Weissfeld, personal communication, April 24, 1995). Research scores were also reversed in this study so higher scores related to higher beliefs. Each subscale related to a dimension of the Health Belief Model (Figure 21): General Health Concerns were considered motivators; General Health Threats and Susceptibility related to the value of illness threat reduction; and Medical Benefits to the probability that compliant behaviour will reduce the threat. Scores for each question in the subscale were added together to get the participants final score on that belief variable.

Using this structured and pretested instrument had advantages as its psychometric properties had been examined by other researchers and therefore could provide strength to the study's findings (Polit & Hungler, 1991). It also allowed comparison of results to other research studies. The disadvantage of using existing measures included the possible misfit of the

instrument in the Newfoundland elderly population which may be different from that in which it was developed (Polit & Hungler, 1991). Reconfirmation of reliability was therefore essential in this study. Culture, language, literacy, and age of the sample could have influenced the interpretation of questions.

Reliability of the Original Weissfeld, Kirscht, and Brock Health Belief Scale. Interrater reliability was strengthened by the researchers through a stringent training of all interviewers including written procedure manuals, lectures, role playing, and mock interviews (Weissfeld, Brock, Kirscht, & Hawthorne, 1987). The researchers examined reliability through a split half method whereby reliability was calculated independently on two random population half groups. The sample was further divided for variables of gender, white-black, and age distributions. Consistent reliability scores were demonstrated across variables. Reliability coefficients above .70 are considered satisfactory for most studies (Polit & Hungler, 1991). Internal consistency (coefficient omega) of the original subscales were reported as; General Health Concern .74, General Health Threat .65, Susceptibility .77, and Medical Benefits .72 (Weissfeld et al., 1987). Reliability was assessed on the Modified Weissfeld, Kirscht, and Brock Health Belief Scale used in this study and will be discussed further in Chapter IV - Results.

Validity of the Original Weissfeld, Kirscht, and Brock Health Belief Scale. Content validity was established by the original researchers through examination of instruments used in previous studies of the Health Belief

Model. It was unknown if content experts were further consulted, however developers of the Health Belief Model were involved in the questionnaire development (Maiman et al., 1977). The original instrument was not used on a sample consisting of only elderly participants. Information supporting criterion related validity was not available on the instrument. Criterion validity provides evidence that the instrument is valid if its results correlate highly with a "gold standard" criterion or testing method (Polit & Hungler, 1991). Based on the long standing difficulty of previous researchers in accurately defining and measuring health beliefs it is likely that more research will continue to be needed in formulating Health Belief Scales that provide criterion related validity, either concurrent or predictive (Redeker, 1988). Establishment of predictive validity for health belief constructs would be the most useful to clinicians who have limited and infrequent access to patients. Predicting which patients were at high risk for nonadherence would allow health care professionals to focus limited resources on those most in need.

Construct validity was established by confirmatory factor analysis on the original instrument (Weissfeld et al., 1990). Confirmatory factor analysis is a method of identifying unitary attributes based on the clustering of items and showing that the dimensional structure of the scale corresponded to the theoretical construct (Polit & Hungler, 1991; Weissfeld et al., 1987). It constitutes another way of looking at convergent, bringing like things together; and divergent, separating non-related items, of a large set of

measures. The factor loading scores for the questions used were identified in Appendix I (Weissfeld et al., 1990). Loadings were low for some questions on the subscales. Factor loadings of 0.3 and greater were considered adequate by the original researchers (Weissfeld et al., 1987). Higher ratings signified greater relation of the item to the stated scale. The researchers concluded that content specific questions for assessing Medical Benefits, those that ask the respondent directly about the disease process of hypertension, were a more valid measure of the construct than general health questions and therefore accounted for why factor loading on these items was greater (Weissfeld et al., 1990). This was evident in the Medical Benefits Scale where question 11 had a higher factor loading than questions 10 and 13 which were much more general and non-disease specific. Question 12 was abstract and may not have been seen by the respondents as related to medical benefits. Over all Medical Benefits appears to have the least construct validity due to the low factor loading for some questions (Appendix I). The Modified Weissfeld, Kirscht, and Brock Health Belief Scale was analyzed on each Medical Benefit question separately based on the low construct validity of the subscale. The low reliability of this subscale was found in this study and will be discussed further in Chapter VI - Results.

Intercorrelations were examined among the four health beliefs in the original scale. All of the scales showed intercorrelation of .20 or less (Weissfeld et al., 1990). These low scale intercorrelations were desirable and indicated the scales were measuring different constructs and

strengthened the construct validity (Weissfeld et al., 1990).

Modifications of the Weissfeld, Kirscht, and Brock Health Belief Scale. The original six scale instrument (Appendix J) was pretested by the researcher using four elderly Newfoundland volunteers. It was felt by these volunteers that the original scale was too long and complicated for this age group. It was then modified by the researcher to reduce the number of items and scales with slight alteration of question wording. Four of the six subscales were chosen by the researcher and were thought to adequately measure the health beliefs selected from the Health Belief Model. Appendix J identified the original questions and Appendix F identified the modifications made. Alterations in the original questionnaire could potentially modify previously established reliability and validity scores. Reliability, Cronbach's alpha, was examined by the researcher on the modified health belief scale and will be discussed in the next chapter.

Medication Evaluation Record

A questionnaire (Appendix G) designed by the researcher, was included in the interview guide. This instrument was used to collect data to answer research questions one through five listed previously in Chapter IV.

The Medication Evaluation Record (MER) consisted of a review of all medications the individual was taking including a medical chart review, examination of medication container labels, pill count, and verbal responses of participants to guided interview questions. These various methods of evaluating medication adherence were not scored separately as comparative

measures of adherence. It was not the intention of this study to determine which of these methods was the most accurate, rather to use all the data collected to reach the most accurate conclusion. The information collected was consolidated in the Medication Evaluation Record and a final measure of adherence per each antihypertensive medication was attained. For the purposes of this study, only prescribed antihypertensive medications taken by the participant were examined. In the interview the respondents were asked questions about whether they were actually taking the medication, the reason for taking each of the prescribed medications, frequency of administration, and any special precautions. Self reporting was a widely accepted indicator of adherence. The advantage of this method was its ease in obtaining the data (Roth, 1987). Patient statements indicating they were not taking their medication were usually corroborated with pill counts or urine testing however statements about the amount of medication taken often have not been correlated with other methods of assessing adherence such as a pill count (Roth, 1987).

Based on previous reported research (Botelho & Dudrak, 1992; Blackwell, 1976; Hawe & Higgins, 1990; Levine et al., 1983; Lorenc & Branthwaite, 1993; Sackett et al., 1975) a person was considered as nonadherent to prescribed antihypertensive medications when he/she was (a) taking more than 110% of antihypertensive medications prescribed, (b) taking less than 80% of medications prescribed, (c) taking medications for the wrong reason (ie., perceptions that the antihypertensive medication was

for a different health problem), (d) unaware of what the medication was for, and (e) taking medications prescribed for others. These categories were referred to as the patterns of nonadherence. The data were scored nominally, no (0) or yes (1), regarding each pattern of nonadherence for each medication. Scores for each medication, therefore, could vary; low score of zero indicating adherence and high score, sum of all nonadherent behaviours per each medication, indicating nonadherence. Adherence to a medication, therefore, was defined in this study as taking greater than or equal to 80% and less than or equal to 110% of prescribed antihypertensive medications, for the right reason and only taking medications prescribed for him/herself. Each pattern was weighted equally. The scores for each pattern of adherence for each medication were added together to get a final score of adherence for each participant. The limitation of this method of analysis was that the relative importance of the different patterns of adherence was not addressed. Scores were cumulative and therefore a person who was nonadherent to a large number of medications would have a greater final score. Further analysis is warranted to look at adherence to categories of antihypertensive medications and outcome effects of nonadherence per category.

A list of currently prescribed medications was obtained in this study from the patient's medical chart prior to the interview. This provided a baseline by which to compare the current medications present in the home at the time of the interview. If there was a medication listed in the medical

chart but not present in the home, the reasons for its absence were asked. Likewise if a medication was found in the home that was not on the chart, the participant was asked where they obtained the prescription. This information was easily confirmed by validating the answer with the medication container label.

Chart review provided a retrospective review of the patient's health and medical management including information about current medication regimens. Use of the medical chart was advantageous as it provided an economical and time efficient method of examining information and trends over time (Polit & Hungler, 1991). The major disadvantage of the medical chart was difficulty tracking the documentation of medication regimens. Problems arose when the medication lists found in the front of the medical chart, were sometimes not up to date with the actual drugs the patient was taking. Some patients were taking more, some less, than those identified in the chart. Scanning through clinic notes was difficult at times as well because often notes would state only "℞ Refill". Researcher error or illegible writing in the chart may have also resulted in references to medications being overlooked in the clinic notes. Other times patients were seeing specialists in addition to their family practice physician resulting in additional medications at home. This was evident by having the specialist name listed on the pill bottle. Charts were not re-evaluated after the interview to search for references to the additional medications found in the respondent's home or for specialist's communications with the family physician. Two patients

identified they had been hospitalized since their last clinic visit and had considerable changes in their medications as a result. Follow up from these hospital visits was not documented on the chart as both patients had only been discharged a few days prior to the interview, which did not leave enough time for correspondences to reach the family practice office.

In all of the above circumstances, the researcher decided to accept the patient's current inventory of medications at home as the foundation for assessment of adherence although this may have introduced a source of error into the results. A reexamination of the chart, physician interview regarding these patients, or repeated home visits might have clarified some of the discrepancies identified, however this was not undertaken and remains a limitation of the research method used. Questions were always asked to the respondent, however, about the medications listed on the patient's chart that they did not have. The patient would either state that the doctor had changed their prescription or they could not remember that drug because it had been so long since it had been prescribed.

Using a pill count and examination of pill bottles had both advantages and disadvantages when assessing medication adherence in chronic illness. Some of these issues were discussed in Chapter II. Advantages included the objectivity and simplicity of measurement (Roth, 1987). Disadvantages included inability of confirming that the patient actually took the medication and information obtained was limited to the pills and bottles examined (Roth, 1987). Patients may have chosen to withhold certain medications from

examination or family members could have been sharing their medications (Roth, 1987).

A "gold standard" does not currently exist to permit perfect measurement of adherence. The combination of chart review, pill bottle examination and pill count, and asking the patient if he/she was actually taking their medications strengthened the validity of data collection in this study. The chart review provided a reference point of assessing medications found in the home. Other methods used in the home built on this source of data and allowed a more accurate evaluation of each individual's adherence to medications.

General Questionnaire

This general questionnaire (Appendix H) was used to answer in part research question four: Is there a significant relationship between selected modifying and enabling factors identified in the Health Belief Model with adherence to antihypertensive medications?; and question five: Is there a significant relationship between mean diastolic blood pressure at the time of the interview and adherence to antihypertensive medication?

The questionnaire was designed to elicit further information pertaining to age, gender, education, income, duration of hypertension, and length of time taking antihypertensive medications. Information on all above categories except gender was collected in categories, thus making them ordinal data. Mean diastolic blood pressure was also examined to determine if adherence to antihypertensive medications was significantly associated

with blood pressure control.

Although blood pressure readings were retrieved from the chart as recorded at the last clinic visit, the reading was not used in analysis for several reasons: (a) time lapse from the clinic visit to the interview widely varied from a few days to several months; (b) equipment used was different; (c) consistency of technique could not be guaranteed; (d) setting differences; and (e) possible "white coat effect" where anxiety felt in the presence of health professionals such as the physician, falsely elevated the blood pressure. The mean of two diastolic blood pressure readings taken during the interview was calculated. Use of multiple measures of blood pressure allows for more precise measurement of patient variability (Thomas, Liehr, DeKeyser, & Friedmann, 1993). Blood pressure measurements used in the initial diagnosis of hypertension were not available for most patients. The diagnosis was made more than ten years ago for 54.9% of the respondents and these records were often filed as earlier volumes of the chart. It is recognized that severity of illness may be a significant factor to consider when examining blood pressure control in relation to adherence. This variable was not controlled for in this study.

Data Analysis

Quantitative data were analyzed using the Statistical Package for the Social Sciences (SPSSX, Statistical Package for the Social Sciences, Inc., 1988). Confidence intervals were calculated using Confidence Interval Analysis (Gardiner, M.J., 1989). Descriptive statistics were used to examine

the demographic characteristics, duration of hypertension, length of time using antihypertensive medications, overall medication usage, and mean diastolic blood pressure.

Research questions one and two were answered using descriptive statistics. Research questions three, four, and five were analyzed using Spearman's rank order correlation coefficient with the exception of assessing the relation between gender and adherence. Chi-square was used to assess the relationship between gender and antihypertensive medication adherence. Gender was measured using nominal data, therefore no higher level of calculation could be used (Shott, 1990).

Nonparametric tests were appropriate for data which did not have a normal distribution (Munro & Page, 1993; Shott, 1990). Spearman's rank order correlation coefficient was considered an appropriate nonparametric test in this case as the degree of linear association between the ordinal ranks of two variables was measured (Munro & Page, 1993; Polit & Hungler, 1991; Shott, 1990). Data were collected in categories for the variables of age, education, income, duration of hypertension, and length of time taking antihypertensive medications. Responses to the Health Belief subscales were selected by the respondents from a Likert scale ranging from low to high agreement and provided ordinal data (Appendix F). Scores for each question in a subscale were added to give a summary score for the subscale. Blood pressure measurements were considered ratio level data (Munro & Page, 1993). The mean diastolic blood pressures measured in this sample

were not normally distributed, however and Pearson's product moment correlation coefficient could not be used. At least one of the measures must be normally distributed to use Pearson's product moment correlation coefficient (Shott, 1990). For all data analysis the results were considered significant when p values were equal or less than .05. Multiple comparisons, as conducted in this study, increased the risk of falsely concluding that a relationship exists, a Type 1 error, (Polit & Hungler, 1991). Caution was therefore needed in the interpretation.

Spearman's rank correlation coefficient could be of any value between -1.00 and +1.00. A score of +1.00 would indicate a "perfect positive linear relationship between the ranks of one variable and the rank of another" (Shott, 1990, p.249). A score of -1.00 would indicate a perfect negative linear relationship. The closer Spearman's rank correlation coefficient comes to -1.00 or +1.00 the stronger the linear relationship between the two variables. A score of 0 would signify no linear relationship. Shott (1990) cautioned, however, that Spearman's rank correlation coefficient of 0 did not mean there was no relationship, only that no linear relationship existed.

Chi - square analysis was appropriate for nominal data. Munro and Page (1993) stated that when chi-square analysis was used tables having more than 20% of the cells with less than five cases, the number of cells should be reduced by collapsing data. If one of the cells has no cases, the size of the table should be reduced (Munro & Page, 1993). A 2x5 chi

square table was used in this analysis when adherence patterns were compared to gender which had a nominal data set. Two of the cells had no entries and 60% of the cells had less than five entries in them. The size of the table was reduced by assessing the relationship of gender to the combination of the two most prevalent categories of adherence; taking more than 110% and taking less than 80% of prescribed antihypertensive medications. Two cells remained empty with 40% of cells having less than five cases. Chi - square analysis generally necessitated large expected frequencies (Shott, 1990). The small sample size, 51 cases, may have reduced the power of the results.

Confidence interval measurement was appropriate to validate significant relationships and provide a measurement of sampling error or sampling variability in randomly selected groups therefore determining the generalizability of results (Munro & Page, 1993; Simon, 1986). Confidence intervals were calculated using the Spearmen's Rank Correlation Coefficient with a possible range therefore of +1 to -1. The intervals were determined on a 95% probability level. The width of the 95% confidence interval indicated the amount of uncertainty about the population variable under examination (Munro & Page, 1993). The width of the interval decreased as the amount of data increased and estimates became more exact (Simon, 1986). They could, however, be most valuable when intermediate sized groups were used (Simon, 1986). Based on previous research on adherence, a recognized complex behaviour, no single variable was anticipated to

account for a large part of the variance. Confidence intervals were therefore be expected to be wider than with variables that would be highly correlated.

Ethical Considerations

The study was reviewed and approved by the Human Investigation Committee of Memorial University of Newfoundland and the Departmental Chair of Family Practice. No disclosures of specific client results were discussed with physicians or family members without expressed permission of the individual. Overall results were discussed with physicians.

Confidentiality was maintained by not removing or copying any part of the clinic records from the clinic site, keeping interview records secured once the interview was completed, and using a code number to identify each interview record. The researcher did not disclose any information obtained throughout the research study. All participants completed an informed consent form at the beginning of the interview. They were informed that if any serious concern arose during the interview about their use of medications or the result of blood pressure measurements, their permission would be sought to discuss these with their physician. Physicians were informed of this protocol as well when they first agreed to participate in the study.

Family members were permitted to sit in during the interview at the client's request but were reminded not to answer questions for the subject. Confidentiality was upheld by not recording names on the interview data collection records. Only code numbers were used for the researcher to link

patients with their charts. This list was kept locked up in the researchers home when not in use for research purposes. Consent forms (Appendix E) were signed by each participant at the beginning of the interview, however withdrawal was permitted at any time. Anonymity was maintained by only discussing grouped data with family practice physicians and research study examiners.

Summary

This chapter has reviewed the sample selection process and instruments used in the study. The psychometric properties of the original Weissfeld, Kirscht, and Brock Health Belief Scale offered acceptable reliability measures. Construct validity, established through confirmatory factor analysis remained a concern for some items particularly those in the Medical Benefits Subscale. Plans for data analysis were presented. Efforts taken to improve the strength of the study were discussed. A combination of data sources were employed to evaluate adherence to antihypertensive medications. The triangulation of data collection would increase the strength of findings. Inherent difficulties in measuring both Health Beliefs and adherence had been well documented by other researchers.

The following chapter will discuss the results of the study including the reliability of the modified Weissfeld, Kirscht, and Brock Health Belief Scale in the sample. The results will be presented for each research question proposed for this study.

CHAPTER VI

Results

Sample Characteristics

The sample consisted of 51 participants who were patients in one of three clinics of the Family Practice Unit. All patients met the inclusion criteria and gave their consent to participate. The demographic characteristics of the sample were summarized in Table 4. Means and standard deviation could not be calculated as data were collected in categories. Categories of age and education were established to allow comparison to national data base information collected by Statistics Canada. The sample was divided into five year age groups while education was defined as (a) less than or equal to Grade 8, (b) High School Attendance (9-12), and (c) post secondary education (13+).

The majority of the sample were females and greater than 75 years old. Analysis of educational levels of the sample revealed that 40 participants (78.5%) were educated above a grade 8 level. A total of 31 participants lived in a household where the income was greater than $20,000 annually. The results will be discussed in comparison to national data in the Chapter V - Discussions.

Duration of Hypertension and Length of Time Taking Antihypertensive Medications

The majority of participants had long histories of hypertension with 28 respondents (54.9%) having it ten years or more. Antihypertensive

medications had been taken for 10 years or more by 25 participants (49%) of the sample. The nature of hypertension as a prevalent chronic illness in

Table 4

Sample Characteristics

Characteristic	Frequency N=51	%
Gender		
male	20	39.2
female	31	60.8
	51	100
Age		
65-69	13	25.5
70-74	11	21.6
75-79	22	43.1
80-84	4	7.8
85-89	1	2.0
	51	100
Education (grade)		
0-8	11	21.6
9-12	26	51.0
13 and over	14	27.5
	51	100
Income $ (thousands)		
<10	7	13.7
10 to < 20	13	25.5
20 to < 30	12	23.5
≥ 30	19	37.3
	51	100

the Newfoundland elderly population combined with the fact that most respondents were over 75 years of age would support this finding. Table 5 summarized these results.

Mean Systolic and Diastolic Blood Pressure

Blood pressure was recorded twice during the interview and an average of the individual's two readings was calculated for both systolic and diastolic pressures. This was recorded as the individual's mean pressure.

Table 5

Duration of Hypertension and Length of Time Taking Antihypertensive Medications

Characteristic	Frequency N=51	%
Length of time with Hypertension (years)		
0- <5	14	27.5
≥5 to <10	9	17.6
≥10	28	54.9
	---	----
	51	100
Length of time on Antihypertensive Medications (years)		
0- <5	17	33.3
≥5 to <10	9	17.6
≥10	25	49.0
	---	----
	51	100

The range of all individual mean systolic blood pressure's was 130-210 mm Hg (SD = 17.86). The corresponding range for all individual mean diastolic blood pressures was 70 to 115 mm Hg (SD = 10.52).

Participants' mean diastolic blood pressure measurements were not collapsed to prevent any loss of information (Munro & Page, 1993). Despite

the fact that all patients were prescribed antihypertensive medications, 29 (56.9%) participants remained hypertensive at the time of blood pressure measurement with an individual mean diastolic pressure equal to or greater than 90 mm Hg. The mean diastolic blood pressure for the sample, the average of all participant means, was 89.61 mm Hg. Line graphs of the mean diastolic and systolic blood pressures are presented in Figure 3 and Figure 4 demonstrating both show some resemblance to a normal distribution. The researcher decided that correlations would be based on a presumption that they were not normally distributed as there was sufficient doubt that such a dispersion was present.

Medication Utilization

A total of 159 prescribed medications were taken by the sample of 51 participants, excluding medications ordered on an "as needed" basis (PRN). These PRN medications were excluded from examination as their frequency of administration varied among patients. No antihypertensive medications were prescribed on a PRN basis. The average number of prescribed drugs taken was 2.96 per patient. Antihypertensive medications accounted for 81/159 (50.9%) of the total number of drugs prescribed and was therefore the most frequently used category of medications in this sample. One patient was taking an antihypertensive medication for the treatment of another condition that required sliding doses. This medication was not included in the analysis. Table 6 identified the breakdown of medications noted on the chart as compared to those found in the respondents' homes.

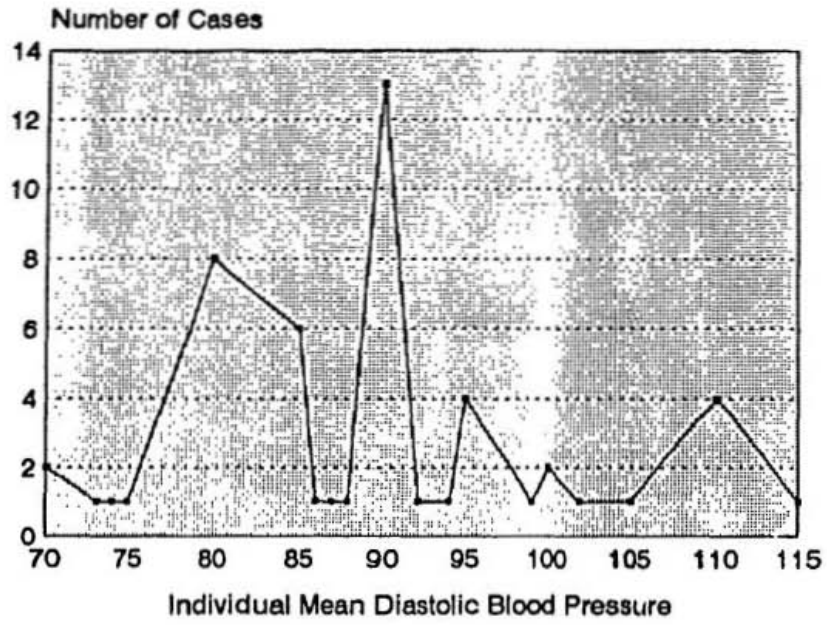


Figure 3 Individual Mean Diastolic Blood Pressure

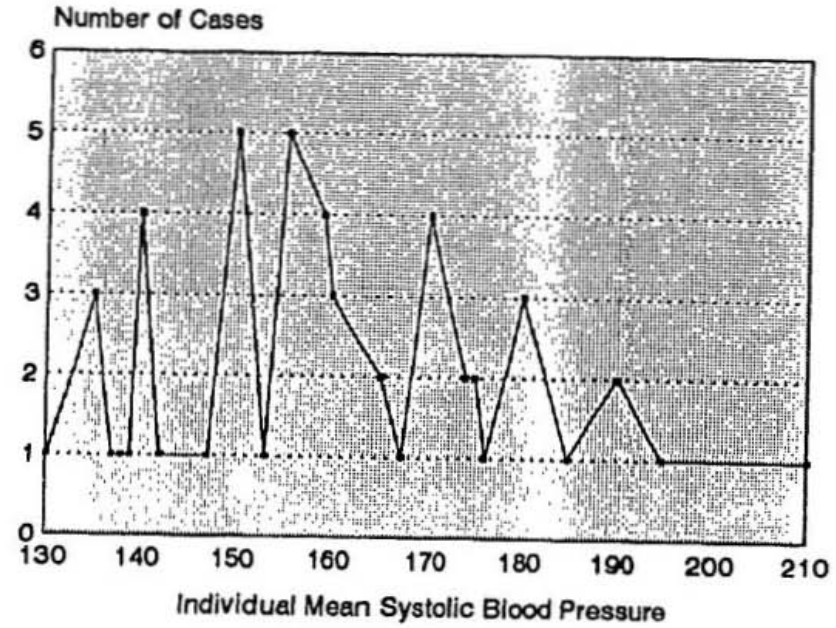


Figure 4 Individual Mean Systolic Blood Pressure

The chart review revealed a total of 174 prescribed non-PRN medications; 81 of which were antihypertensives. A total of 31 medications prescribed on the chart were not present in the participants homes; eight of which were antihypertensives. Two patients who had recently been discharged from hospital accounted for five of these eight antihypertensive medications that were discontinued. Other patients stated their doctor had changed these treatments months or even years before. A second and more thorough chart review after the interview may have confirmed these findings. Use of the medical chart to determine a patient's medication regimen was difficult when medications were not documented in one area of the chart and updated current. A further 17 prescribed medications; eight of which were antihypertensives, were found in the respondents' homes but had not been found prescribed on the medical chart during the review. The same two patients who had been hospitalized accounted for four of these eight new antihypertensive medications which were prescribed while in hospital. These eight medications were included in the study. The group of eight antihypertensive medications listed in the chart but not found in the home were not included in the analysis as sufficient evidence existed that they were actually currently prescribed for the individual. Based on the interactions with the participants, it was believed that their reasons for the existence of extra medication and absence of others were genuine. While these medications could not be classified as adherent or nonadherent with absolute confidence, it was known that charts were not always updated

with the precision needed for such a research study.

Medication Adherence

Adherence to Antihypertensive Medication

Prevalence. The first research question stated: What is the prevalence of adherence to antihypertensive medications in this convenience sample of Newfoundland elderly?

The categories of "taking medications for the wrong reason" and "not knowing what their medication was for" were combined due to the low responses for each. Twenty-two participants (43.1%) were judged to be adherent to their antihypertensive medications based on the cumulative score of the four adherence criteria (Table 6). Twenty (39.1%) participants had only one non-adherent behaviour for one antihypertensive medication; four (7.8%) respondents had two nonadherent behaviours and four (7.8%) had three nonadherent behaviours. One (2.0%) individual was found to have five nonadherent behaviours.

Adherence Patterns. The second research question referred to patterns of adherence: What are the patterns of adherence to antihypertensive medication regimens in this sample?

A list of medications used by this sample was provided in Appendix K. A total of 81 antihypertensive medications were used by the 51 participants; 26 diuretics, 14 beta blockers, 16 ACE inhibitors, 17 calcium channel blockers, three central acting agents, three combination drugs, and one each of nitrate and alpha blocker. The action of these medication to reduce blood

Table 6

Adherence Prevalence

Episode of Misuse	Number of Patients	% of Sample
Overall # of participants with:		
0 episodes of misuse	22	43.1
1 episodes of misuse	20	39.2
2 episodes of misuse	4	7.8
3 episodes of misuse	4	7.8
4 episodes of misuse	0	0
5 episodes of misuse	1	2.0

pressure was confirmed by referencing to the Compendulium of Pharmaceuticals and Specialties (Krogh, 1994). Four categories of misuse were assessed and results were summarized in Table 7. Table 8 outlined the number of antihypertensive medications involved in each category. An individual's score on this Medication Evaluation was the total of all scores in each category added together to get the overall nonadherence measure. The range was 0 to 5. Ten participants were adherent to some of their antihypertensive medications but nonadherent to others. Twenty-eight participants were only taking one antihypertensive medication.

A total of 45 medication misuse behaviours were observed in 43/81 antihypertensive medications taken by 29 respondents the sample. Two medications were therefore misused in two categories. Most medication misuse 33/45 (73%) was due to taking less than 80% of prescribed medication. One participant was found to be taking two medications less

Table 7

Antihypertensive Medication Adherence Patterns: Patient Data

Category of misuse of Antihypertensive Medications	Number of antihypertensive medications misused	Number of patients N = 51	% of sample
# medications taken at > 110% of prescribed amount	0	47	92.2
	1	2	3.9
	2	1	2.0
	3	1	2.0
		---	---
		51	100%
# medications taken at < 80% of prescribed amount	0	25	49.1
	1	20	39.2
	2	5	9.8
	3	1	2.0
		---	---
		51	100%
# medications taken for wrong reason or patient does not know	0	49	96.1
	1	0	0
	2	1	2.0
	3	1	2.0
		---	---
		51	100%
# medications taken from another patient	0	51	100%

Table 8

Antihypertensive Medication Categories of Misuse: Medication Data

Category of misuse of Antihypertensive Medications	Number of medications (N=81)	% of antihypertensive medications
Taking > 110% of prescribed amount		
no	74	91.4
yes	7	8.6
	--	----
	81	100%
Taking < 80% of prescribed amount		
no	48	59.3
yes	33	40.7
	--	----
	81	100%
Taking for wrong reason or patient does not know		
no	76	93.8
yes	5	6.2
	--	----
	81	100%
Taking antihypertensive medications from another patient		
no	81	100
yes	0	0
	--	----
	81	100%
Adherent	36	44.4
Non adherent	45	55.5
	----	----
	81	100%

than 80% of that prescribed. In addition this same individual did not know what three antihypertensive medication were for. This person therefore had five misuse behaviours.

Four of the eight classifications of antihypertensive medications accounted for 73 of the 81 medications taken by the participants (Appendix K). Misuse behaviours were observed in 9/14 beta blockers (64%), 7/16 ACE inhibitors (44%), 11/17 calcium channel blockers (65%), and 13/26 diuretics (50%). Further investigation into the role of side effects on adherence may have revealed significant association with selected types of nonadherence such as over use or under use. Such an analysis was not conducted within the scope of this research study.

Health Beliefs. Four health beliefs were examined using the modified Weissfeld, Kirscht, and Brock Health Belief Scale; (a) General Health Concerns, (b) General Health Threats, (c) Susceptibility, (d) Medical Beliefs. Inter-rater reliability was not assessed in the study as the researcher conducted all interviews. Internal consistency alpha coefficients in this study were .61 for the General Health Concerns subscale; .63 for the General Health Threats subscale; and .77 for the Susceptibility subscale. Internal consistency for the Medical Benefits subscale was low at .17. Coefficient omega scores, determined for these corresponding original scales, were .74, .65, .77, and .72 respectively (Weissfeld et al., 1990).

The original medical benefit subscale contained seven questions but the modified scale contained only four of the questions. Closer examination

of the modified medical benefit subscale, in retrospect, revealed one question that may not have been related to the theme of Medical Benefits at all and another that may not have been appropriate to the Canadian context. Question #12 asked " How important do you think controlling blood pressure is? This question actually only had a factor loading of .18 as reported by the original researchers (Weissfeld et al., 1990). Question #13 "Overall, how easy is it to get medical care when you want it?" , also with a factor loading of .18, may have been much more of an issue in the American health care system where access often depended on ability to pay, while in Canada universal health care has existed with drug cost subsidy for those who needed it. The Family Practice Unit involved in this study also provides 24 hour coverage and house calls. Questions in the scale were subsequently analyzed individually to assess their relationship with adherence due to the low internal consistency on the collective scale.

The results of the Health Beliefs data were summarised in Table 9. Scores on the belief scales were measured such that higher scores, once data collected was reversed, indicated higher beliefs (Weissfeld et al., 1990). Participants were given the option to answer "Don't know" to all questions on the Health Belief Scales. These answers were assigned a missing values code in the analysis. Most participants did not use this option except for the Susceptibility Subscale with only 40 cases being included in the analysis due to 11(21.6%) respondents stating "Don't know" to one or more of the questions asked. This subscale was different from the others in that

Table 9

Health Belief Subscales: Summary of Responses (N=51)

Subscale	More/very/ always	As much as/ somewhat/ sometimes	Less/a little/ rarely	Much less/ not at all/ never	Do not know
General Health Concerns					
#1	20	23	8	0	0
#2	17	11	14	9	0
#3	43	6	2	0	0
#4	11	15	10	14	1
General Health Threats					
#5	5	16	15	15	0
#6	7	19	17	6	2
Susceptibility					
#7	7	7	14	21	2
#8	5	5	12	20	9
#9	7	8	12	18	6
Medical Benefits					
#10	46	3	2	0	0
#11	35	2	3	0	6
#12	49	2	0	0	0
#13	49	2	0	0	0

questions were future oriented. They required the individual to make judgements about their future health which may have been difficult for many participants. Analysis was conducted excluding all missing values which reduced the available sample size for these variables and therefore reduced the power of the results for these items. The results for the Medical Benefits subscale were skewed as evident in the pattern of responses and this was

considered in the interpretation of results.

Relationship between Health Beliefs and Adherence to Antihypertensive Medications. The relationship between health beliefs and antihypertensive medication adherence was assessed to answer research question 3.

Spearman's rank correlation coefficient was used to determine the degree of association between the health beliefs measured by the modified Weissfeld, Kirscht, and Brock Health Belief Scale and the level of adherence. Due to the low reliability found with the Medical Benefits scale, individual questions were analyzed separately. Levels of adherence were measured such that higher scores on the Medication Evaluation Record indicated less adherence. Each individual's score was arrived at by adding all medication misuse errors made by that person. The Health Belief Scales produced data at the ordinal level as did the Medication Evaluation Record. The relationship between Health Belief scores and adherence to antihypertensive medications was noted in Table 10 as well as the confidence intervals.

Table 10 revealed that a positive relationship existed between some of the health beliefs and adherence to antihypertensive medications but only General Health Threats had a significant relationship ($p = .004$). A positive relationship signified that increased health belief (higher score on the belief scale) corresponded to greater nonadherence (high score on the medication evaluation record). This meant that, contrary to the predictions of the model, when a person perceived greater Health Threats he/she was less

Table 10

Relationships Between Health Beliefs and Adherence to Antihypertensive Medications

Health Belief	Relationship to adherence: Spearman's rank correlation coefficient r_s	p value	Significance	Confidence Interval
General Health Concerns	.06	.328	non-significant	-.218 to .337
General Health Threats	.37	.004*	significant	.103 to .592
Susceptibility	.11	.254	non-significant	-.211 to .406
Medical Benefits Q1	-.16	.136	all non-significant	-.415 to .124
Medical Benefits Q2	-.03	.424		-.320 to .267
Medical Benefits Q3	.06	.340		-.220 to .329
Medical Benefits Q4	-.10	.251		-.362 to .184

* $p < .05$

adherent to antihypertensive medications. General Health Concerns, Medical Benefits and Susceptibility were not significantly related to adherence in this sample using the measures chosen for this study. The confidence intervals were determined using the Spearman Rank Correlation coefficient with a potential range of -1 to +1. The size of confidence interval was determined by adding together the interval areas below and above zero. The widest intervals were found for non significant relationships, susceptibility having the greatest. The scale measuring susceptibility also had the lowest sample

size (40) as several patients answered 'Don't know' for one or more of these questions.

Relationship Between Demographic Characteristics and Adherence to Antihypertensive Medications. The relationship between demographic characteristics and adherence to antihypertensive medication was measured to answer, in part, research question #4: Is there a significant relationship between selected modifying and enabling factors identified in the Health Belief Model with adherence to antihypertensive medications?

Age, gender, income and education level were examined to determine if a significant relationship existed between each variable and adherence to antihypertensive medications. The chi-square result between gender and adherence to antihypertensive medications showed no significant relationship between the variables, χ^2 (3, $N = 51$) = 2.08, $p = .56$. Interpretation of the results should be guarded as 40% of cells in the analysis contained less than five entries (Munro & Page, 1993). The Spearman rank correlation coefficient was used to assess the relationship between age, income and education and adherence to antihypertensive medications. The results were summarized in Table 11.

No significant relationship was found between age, education or income and adherence to antihypertensive medications. Income showed the strongest association, however it did not reach a level of significance. Confidence intervals showed similar patterns to that of Health Beliefs' analysis. The confidence interval encompassed 25% of the possible range

Table 11

Relationship Between Demographic Characteristics and Adherence to Antihypertensive Medications

Demographic Characteristics	Relationship to Adherence to Antihypertensive Medications: Spearman's rank correlation coefficient r_s	p value	Significance	Confidence Intervals
Age	-.12	.205	non-significant	-.381 to .210
Education	-.16	.128	non-significant	-.417 to .121
Income	-.21	.070	non-significant	-.459 to .070

of the correlation coefficient, -1 to +1 suggesting the correlations were not strong.

Relationship Between Duration of Hypertension and Length of Time on Antihypertensive Medication and Adherence to Antihypertensive Medications. Both duration of time with hypertension and length of time on antihypertensive medication were examined to determine if a significant relationship existed with adherence to antihypertensive medications. No significant relationship was found (Table 12). Confidence intervals were similar to those discussed previously.

Table 12

Relationship Between Duration of Hypertension, Length of Time on Antihypertensive Medications and Adherence to Antihypertensive Medications

Variable	Relationship to Adherence to Antihypertensive Medications: Spearman's rank correlation coefficient r_s	p value	Significance	Confidence Interval
Time with Hypertension	.06	.330	non-significant	-.219 to .330
Time on Hypertensive Medications	.10	.236	non-significant	-.181 to .366

Relationship Between Adherence to Antihypertensive Medications and Mean Diastolic Blood Pressure Adherence. The relationship between adherence to antihypertensive medications and mean diastolic blood pressure was measured to answer research question #5: Is there a significant relationship between adherence to antihypertensive medications and mean diastolic blood pressure at the time of the interview? A significant relationship was observed between adherence to antihypertensive medications and mean diastolic blood pressure using Spearman's rank correlation coefficient (r_s = .29; p = .018; Confidence interval = .0157 to .524). Adherence decreased as mean diastolic blood pressure increased. The effect of other variables such as number of antihypertensive medications

taken, type of antihypertensive medication, and side effects of medications on blood pressure control were not known. The confidence interval was similar to that previously noted for the other associations accounting for 25% of the -1 to +1 interval.

Although not an objective of the study, association between adherence to antihypertensive medications and mean systolic blood pressure in the sample was measured using Spearman's rank correlation coefficient. Frequency distribution of the individuals' mean systolic blood pressures was given in Figure 4. A significant positive association resulted (r_s = .26; p = .033; Confidence interval = -.0168 to .500). Non adherence was significantly related therefore to higher systolic blood pressure. The confidence interval was wide encompassing approximately 25% of the interval +1 to -1.

The measurement of mean systolic blood pressure in the sample revealed that 60.8% had a systolic blood pressure greater than or equal to 160 mm Hg; a criterion commonly used for systolic hypertension (Carethers & Blanchette, 1989). Diastolic and systolic hypertension was experienced by 17 (33%) participants. Systolic hypertension has been recognized as an important risk factor for development of stroke, other cardiovascular diseases, and death in the elderly population (Systolic Hypertension in the Elderly Program Cooperative Research Group, 1991).

Summary

The data analyzed in this study showed one significant relationship

between one Health Belief and adherence to antihypertensive medications. Increased General Health Threats were significantly related to less adherence to antihypertensive medications. Three other beliefs examined did not relate significantly.

Six modifying and enabling factors (gender, age, education, income, duration of hypertension, or length of time on antihypertensive medication regimens) did not have significant relationships with adherence to antihypertensive medications. Adherence to antihypertensive medications was significantly correlated with mean diastolic blood pressure although it was not an element of the Health Belief Model. Replication of the study was recommended before results could be generalized to the urban elderly population in Newfoundland.

CHAPTER VII

Discussion

Sample Characteristics

The sample closely resembles the national population for gender. It is not, however, representative of the elderly Canadian cohort for age, education or income, although only those with hypertension are in the sample (Table 13). The average level of education of in the sample is higher than that of the Canadian elderly population. Data from this sample illustrates income levels differ by 10-20% in each income bracket from the national elderly population. The sample results show 78.5% are educated at the high school level or higher verses 60.4% in the Canadian elderly population. Provincial sources, however, indicated that Newfoundland had a higher level of illiteracy than the Canadian average; 44% versus 24% (Newfoundland & Labrador Literacy Coalition, 1991). These data combined suggest, therefore, that the sample is not representative of the Canadian or Newfoundland elderly population assuming higher education is positively correlated with greater literacy.

The study sample represents a cross section of the elderly population who could attend the family practice clinic and met selected inclusion criteria. They may, therefore, not be representative of the entire elderly group with hypertension. The frail elderly who are generally unable to attend a clinic setting and those living in institutional care are not included. The results from this study may not be generalizable to the Canadian elderly

Table 13

Sample Characteristics: Comparison to National Data

Characteristic	Sample (%)	National (%)
Gender		
Female	60.8	58[a]
Male	39.2	42[a]
Age (years)		
65-74	47.1	60[a]
75 and over	52.9	40[a]
Education (grade)		
No Schooling	-	2.6[b]
one to eight	21.6	36.9[b]
9-13	51	34.8[b]
post secondary	27.5	25.6[b]
Income (dollars)		
< 20,000	39.2	27.6[b]
≥20,000-30,000	23.5	43.4[b]
> 30,000	37.3	28.2[b]

[a] Statistics Canada (1992)

[b] Norland (1994)

population without validation in a more representative sample.

The majority of the sample (54.9%) report having hypertension for ten years or more and 49% report taking antihypertensive medications for 10 years or more, confirming the chronic nature of this condition. Hypertension has been rated the third most prevalent health problem in Canada (Statistics

Canada, 1994). The Newfoundland Heart Health Study reported that drug therapy was the primary treatment given for hypertension (Newfoundland Department of Health & Department of National Health & Welfare, 1990).

Twenty-nine participants (56.9%) are hypertensive based on the definition used in this study of diastolic blood pressure greater than or equal to 90 mm Hg. All are prescribed antihypertensive medication. One possible explanation is that 43.1% of the sample did implement part or all of their therapeutic regimen for hypertension which thus contributes to controlling their blood pressure. It is assumed that all participants were hypertensive prior to commencing their antihypertensive medication regimen although this was not confirmed in the chart review. It is unknown what definition of hypertension was used at the onset of therapy as the majority of participants were diagnosed over 10 years ago and medical information of 10 years or older is no longer available on their current charts. It is also unknown what role other factors may have on hypertension control such as effects of other drugs, diet, or exercise. Other disease processes may further increase blood pressure such as chronic renal disease.

Systolic hypertension has also been recognized as an important indicator of cardiovascular disease (Carethers & Blanchette, 1989; Systolic Hypertension in the Elderly Program Cooperative Research Group, 1991). With its role particularly recognized in the elderly, future research on this population should include both measures of blood pressure in the selection criteria and analysis. More participants exhibit systolic hypertension than

diastolic hypertension in this study, 60.8% versus 56.9%. Seventeen participants (33%) have both systolic and diastolic hypertension despite being prescribed antihypertensive medications.

The average number of prescribed medications, excluding PRN's, taken by this sample is 2.96 per participant which is less than previously reported studies which also excluded PRN medications (Botelho & Dudrak, 1992; Darnell et al., 1986; Steward et al., 1991). It is unknown if the low rate in this sample is reflective of the Newfoundland population at large or if this finding is unique to the family practice unit selected for this study.

The average number of antihypertensive medications is 1.58 per participant and they account for 50.9% of all prescribed medications taken by this sample. The Newfoundland and Canadian Blood Pressure Studies reported 80% of individuals with hypertension in Newfoundland were treated with antihypertensive medications versus 87% nationally (Health & Welfare Canada, 1989; Newfoundland Department of Health & Department of National Health & Welfare, 1990). Antihypertensive medications continue to be the treatment of choice for hypertension with many patients requiring more than one drug to control the disease.

Nonantihypertensive medications accounted for almost half of all non-PRN medications taken. No further analysis was conducted on the nonantihypertensive medications prescribed since it was not the purpose of this study. Further analysis including all prescribed medications used by this sample may be desirable.

Patterns of Adherence

Research questions one and two will be discussed together.

What is the prevalence of adherence to antihypertensive medication regimens in this convenience sample of Newfoundland elderly ?

What are the patterns of adherence to antihypertensive medication regimens in this sample?

The results show 43.1% of the sample are adherent. Analysis of the medication data reveals 44.4% (36/81) of all antihypertensive medications are taken within the established definitions of adherence. These findings are generally congruent with those of other researchers (Botelho & Dudrak, 1993; Levine et al., 1983; Lorenc & Branthwaite, 1993; Murray et al., 1986; Sackett et al., 1975). Lorenc and Branthwaite (1993) found 26% of the sample were taking more than 110% of their prescribed regimens, versus 7.9% in this study. This type of drug misuse is not a significant form of nonadherence in the study sample. Under use of medications accounts for 59.3% of the nonadherence in this study similar to that found by other studies (Levine et al., 1983; Lorenc & Branthwaite, 1993; Sackett et al., 1975).

Murray et al. (1986) analyzed 'episodes of nonadherence' which referred to any misuse of the medication observed. A single medication could exhibit more than one episode of nonadherence (i.e. under use, wrong route, wrong timing). These were referred to as categories of misuse in this study with 45 misuse episodes identified (Table 8). Of the 147 episodes of

nonadherence they observed, 74.8% were under use and 7.5% over use compared to 73.3% and 15.5%, respectively, found in this study. Further research on medications under use is needed to explore the reasons for this behaviour. Plausible rationales may include other modifying and enabling factors identified in the Health Belief Model such as cost, difficulty obtaining refill prescriptions, side effects or feeling that the drugs may not be needed (Figure 2). If these act as barriers, under use may result. Memory difficulties may also influence adherence.

It should be noted that the correlations found in this study should be interpreted with caution since the sample was small. Only the category of "less than 80% use" gave an adequate discrimination between the adherent versus nonadherent participants. The other three categories of adherence showed results that were possibly too skewed to adequately test the relationship between adherence and the variables of the Health Belief Model. Further analysis focusing only on the category of under use may be needed to yield additional findings.

Relationship Between Health Belief Model and Adherence to Antihypertensive Medications

Health Beliefs and Adherence to Antihypertensive Medications

Research question three: Is there a significant relationship among four selected health beliefs identified in the Health Belief Model and adherence to antihypertensive medications?

General Health Concerns, Medical Benefits, and Susceptibility health

beliefs are not significantly related, in this study, with the level of adherence demonstrated by the scores on the Spearman rank correlation coefficient. Higher health belief scores, signifying greater belief in the element being tested are, however, generally associated with higher levels of nonadherence. Only General Health Threats reaches a significant level of association with adherence. Each will be discussed in reference to existing research.

Only one study was identified which examined Health Concerns (Lorenc & Branthwaite, 1993). An inverse significant relationship of adherence to antihypertensive medication regimens and General Health Concerns in chronic illness was noted; greater adherence was associated with less General Health Concern. Although not significant, this inverse association is present in this study. This is contrary, however, to the premise of the Health Belief Model that increased health concern was positively associated with improved adherence to therapeutic regimens (Lorenc & Branthwaite, 1993). Perhaps greater health concerns are present in individuals who are more active in determining their own management of chronic illness although this variable is not tested in this study. The Model identified several variables related to patient involvement in their health regimens. Certain individuals may take greater control over managing their disease including selective use of medications. It is also possible that those with higher concerns may feel that they cannot be helped by medications and have less faith in their ability to control hypertension. Further research is

needed to better understand the individual who expresses a high level of concern over their health yet chooses to be nonadherent to medication regimens.

General Health Threats and adherence exhibit a positive significant relationship in the study ($p = .004$). Those who were threatened more, adhered less. This is contrary to the theory of the Health Belief Model. General Health Threats have been researched by other investigators but no studies were identified that examined the relationship between Health Threats and adherence to antihypertensive medications. This study may be one of the first to examine this relationship and suggests that the Model may not be valid in assuming greater feelings of threats from the illness will lead to adherence. Weissfeld et al. (1990) analyzed the role of General Health Threats against several sociodemographic or health status markers. They found that General Health Threat beliefs were significantly higher in women and in those participants with poor health status. Medication adherence was not examined however.

It is unknown why General Health Threats have a significant relationship with adherence to antihypertensive medications in this study. The two questions were non-disease specific and therefore not directly related to hypertension. Responses to question five and six of the Modified Weissfeld, Kirscht, and Brock Health Belief Scale indicate the sample feel they are in good health. This does not mean, however, that the respondents are not aware of Health Threats or not motivated to stay healthy. They may

not see hypertension as a threat at all.

The education level of this sample is higher than that of their Canadian counterparts. It is possible that this could translate to a greater knowledge of hypertension and its management including alternative regimens such as exercise, weight control and salt reduction. This could be tested through a follow up study of these participants. Personal choice to enhance nonpharmacological management strategies of hypertension may reduce reliance or belief in antihypertensive medications. Nonadherence may also be an intentional adaptation by this age group to compensate for the physiological changes of aging and provide a balance with side effects of medications experienced (Cooper et al., 1982). Individuals may chose behaviours that are suited to their life-style, belief patterns, and personal priorities (Roberson, 1992). Individuals in this study may possess a higher level of understanding of their disease and treatment. They may feel, however, that they are doing well with their management choices and are content with their quality of life; an outcome measurement not assessed in this study or the Health Belief Model that goes beyond blood pressure control often identified as the goal of medical management. It is also conceivable that people who get their high blood pressure under control by being adherent, would become less threatened. Further analysis is warranted to determine the relationship between those with high blood pressure and their perceived Health Threats.

Bandura's concept of self-efficacy offered another possible

explanation (Rosenstock, Strecher, & Becker, 1988). The concept of self efficacy referred to the feeling an individual had that he/she was personally capable of adopting the expected behaviour (Rosenstock et al., 1988); specifically adherence to antihypertensive medications in this study. Individuals may have felt high levels of threat regarding their health status but not felt able to manage the treatment regimens prescribed (Becker, 1985; Rosenstock et al., 1988). Strategies which enhance self efficacy may therefore lead to improved adherence. Further research assessing self efficacy in the elderly population and evaluating its relationship with adherence may prove a beneficial direction of inquiry.

Medical benefits have been more widely investigated in studies of adherence to antihypertensive medication (Andreoli, 1981; Cronin, 1986; Jones et al., 1987; Kirscht & Rosenstock, 1977; Kison, 1992; Lorenc & Branthwaite, 1993). While some found a positive significant relationship between medical benefits and adherence to antihypertensive medications (Kirscht & Rosenstock, 1977; Kison, 1992; Lorenc & Branthwaite, 1993), others found no relationship between these variables (Andreoli, 1981; Cronin, 1986). Jones et al. (1987) found a significant positive relationship between keeping follow up appointments in a sample of patients with hypertension and health beliefs about treatment benefits. The medical benefit scale used in this study had low reliability and therefore individual questions were examined separately. No significant relationship was present between any of the four medical benefits questions and adherence.

The relationship between susceptibility to illness and adherence to antihypertensive medications found in this study is in keeping with that of Andreoli (1981) and Cronin (1986) who both used the same adherence measurement tool. Kirscht and Rosenstock (1977) found a significant relationship.

Enabling and Modifying Factors and Adherence to Antihypertensive Medications

Research question four: Is there a significant relationship between selected modifying and enabling factors identified in the Health Belief Model and adherence to antihypertensive medications?

Demographic Characteristics. Previous research has not supported any consistent significant relationship between age, gender, education, or income and adherence to medications (Cooper et al., 1982; Craig, 1985; Klein et al., 1982; Lorenc & Branthwaite, 1993; Owen et al., 1985). The above findings are also present in this sample. Coons et al. (1994) however did find nonadherence was significantly associated ($p = .0011$) with higher socioeconomic status. Although not significant, a similar relationship is present in this sample. Interventions geared at improving adherence should not be restricted therefore to the more socially disadvantaged as is often the target of local health promotion campaigns. Individuals with higher socioeconomic level may indeed benefit from strategies to improve adherence however more research is needed to clarify this relationship.

Duration of Hypertension and Length of Time Taking Antihypertensive Medications. The duration of hypertension and the length of time taking antihypertensive medications are not significantly related to adherence in this sample. DeVon and Powers (1984) found no relationship between duration of hypertension and Health Beliefs. They assumed higher belief scores were equated with "greater compliance potential" (p. 12) to antihypertensive medications, however, these researchers did not validate this assumption. Few studies have assessed if these variables were related to adherence to antihypertensive medications. Related research, however, has added understanding to these issues.

Steiner, Robbins, Roth and Hammond (1993) studied the acquisition of maintenance medications by patients taking long term cardiac medication regimens. They found that acquisition was higher when prescriptions for longer periods of time were given as patients did not have to make arrangements for filling prescriptions as often. Lorenc and Branthwaite (1993) compared long term medication therapy to short course antibiotic therapy and found that older adults living alone had the greatest difficulty adhering to short term medication therapy. There was no difference between short term and long term medication adherence for elderly participants not living alone. Living arrangements were not assessed in this study. These research studies have suggested that underlying issues inherent to long term medication use may influence adherence and further research is warranted in this area.

Adherence to Antihypertensive Medications and Mean Diastolic Blood Pressure

Research question five: Is there a significant relationship between adherence to antihypertensive medications and mean diastolic blood pressure at the time of interview?

A significant relationship is present ($p = .018$) indicating that lower diastolic blood pressure relates to better adherence to antihypertensive medications. One would expect a significant relationship between these variables if the medications fulfil their role in controlling blood pressure. Control for other factors known to influence hypertension such as weight, diet, exercise and salt intake was not conducted in this study and therefore their influence on blood pressure in this sample is unknown.

Some researchers have assumed that blood pressure control is a valid indicator of adherence to antihypertensive medications while others have not. Cronin (1986), in a sample of 38 participants, defined non adherence as having a diastolic blood pressure greater than 90 mm Hg and a low score on a self reporting scale. Participants were classified as adherent if they exhibited a diastolic blood pressure less than 90 mm Hg and a high score on the self reporting scale. Andreoli (1981) also used diastolic blood pressure measurement to assign 71 participants to adherent and non adherent groups at the onset of the research study. No other method of assessing patients' adherence status was used. DeVon and Powers (1984) found no difference in medication adherence between 15 participants with controlled

hypertension versus 15 noncontrolled participants. Blood pressure control was not used as a determinant of adherence in this Newfoundland study. DeVon and Powers (1984) suggested that control of blood pressure may not necessarily be synonymous with adherence and suggest illness-related adjustment may have a significant influence on it. Coons et al. (1994) similarly found noncompliance was significantly associated with higher psychological distress. This domain of stress and coping behaviour is not directly addressed in the Health Belief Model but offers another alternate route of investigation to understand adherent behaviour.

Limitations of the Study

Several limitations of the study may have influenced the findings. These will be discussed in terms of the research design, sample selection and size, and researcher effects.

Design Limitations

Generalizability of findings through comparison to other published studies is difficult as most were based on American populations. The structured interview method used limits the information gained to the questions asked. Other relevant factors that may be influencing medication taking behaviours may be overlooked.

The initial contact with the respondent was always made by the clinic staff as requested by the Human Investigations Committee. The researcher, a nurse, may have been viewed therefore, as an extension of the physician and consequently may influence answers to the questions asked.

Respondents may have suspected their doctor would see their answers even though they were told they were confidential. Their answers may therefore be biased to what they wanted their doctor to know about them. Direct solicitation of patients through public advertising might have reduced this source of bias however self-selection bias may have been introduced.

The process of completing a questionnaire may have been unnerving or confusing to some elderly participants although it was unlikely that it influenced the measures of adherence such as pill count, examination of pill bottles, and chart review. Breaks were provided, where necessary, throughout the interview to enhance the comfort of the elderly. Physical, cognitive, mental, or environmental variables may have impeded accurate completion. These may include visual or hearing deficits, memory impairment, or noise in the setting. The length of the interview, approximately one hour may also have been tiring to some participants. These stressors may have falsely elevated the participants blood pressure. Every effort was taken to reduce the potential effects of aging as discussed in the Chapter V.

Ongoing difficulties in determining adherence levels, as previously discussed in Chapter V, also effected this study. Pill counts, although reported to be as accurate as other methods to date (Roth,1987), still have not achieved totally accurate results especially in chronic illness. Greater control is obtained if the researcher can control the issuance of medications to the participant and visit at a later time to assess adherence. Greater

control, although ideal, was not possible in this study involving community based elderly who have total control in refilling their prescriptions and self administering their medications. A combination of methods, therefore, such as examining the medical record, examining pill bottles, counting pills, and asking structured interview questions were used in an effort to increase the accuracy of the adherence assessment in this study. It was not the purpose of this study to compare the reliability and validity of various methods of measuring adherence, only to reach one final measure. Reliance on multiple methods of assessing adherence could be considered a strength of this study of Newfoundland elderly with hypertension.

The researcher, in assessing medication use in this study, found a number of variables which may have influenced the measure of adherence. It is unknown, however, if these actually influenced adherence itself, or rather the attempt to measure it. Some participants had previously prescribed drugs on hand that they were no longer taking. In addition, one medication may have run out before another, yet it was more convenient to get the doctor to write the refill prescriptions for all the medications at one time. The patient would then purchase all medications together. While this was most likely convenient to the patient as he/she did not have to return to the doctor and pharmacy a few days later, it meant that the patient, over time, would have a month or more extra medication available. This occurred more often in patients whose medication regimen did not change over several months or years.

All patients would refill their prescriptions before the pills ran out. This would give the appearance that the patient was not taking enough medication when labels were examined. Further questioning would often validate the practice of early purchasing. Reasons commonly given for early purchasing included difficulty getting to a drug store, depending on friends or relatives to assist in filling prescriptions, and concerns about the weather in winter. Recognizing the practice of early renewal of prescriptions, during the interview the participant would be questioned as to when they actually started taking pills from the bottle and if they had combined pills from an previous prescription to the new one. They were asked to recollect as much as possible how many pills were added and when.

Another practice that made the pill count difficult was the way medications were stored once the prescription was filled. Some individuals would pour the new medications in with the remaining ones. If they poured them into the old container instead of using the new one, the dates would lead to false conclusions regarding adherence. Use of commercially available daily and weekly reminder containers was widely noted. At times pill bottles were discarded once these were filled, again making determination of the exact date of filling prescription difficult. Further inquiry would usually elicit more information by retrieving the receipt, checking the calender where it was written down or even calling the pharmacy. The assessment of adherence to medications for the treatment of chronic illness remains a challenge when treatments cover several years (Lorenc & Branthwaite,

1993) as in the majority of cases in this study.

Sample Selection Bias

The study was limited to a Newfoundland elderly sample from an urban population. Respondents were also restricted to those who use the Family Practice Unit of a particular teaching hospital who may themselves be different than the population at large. The sample was a convenience sample and therefore is not a true representation of the population. Patients excluded because they did not come to the clinic in more than a year may have been actually nonadherent rather than moved, changed physicians, or deceased as suggested by the physicians. Patients identified through the memory of physicians may have been biased to those whom they knew were adherent although every effort was made to capture all eligible participants. Physicians were asked however, not to exclude anyone who fit the criteria.

Physicians in the practice suggested that their patients may be unique as they have chosen a teaching based clinic rather than a general practice available in other sectors of the city. Conclusions drawn from this population, therefore, cannot be generalized to the population at large. They will, however, provide a comparison group for future replication research in other hypertensive populations. Further research is needed to determine if indeed the patient population is unique or if the nature of the Family Practice Unit is different. The impact of population or family practice characteristic not assessed in this study may have significant influence on the outcome of

adherence to antihypertensive medications. The unique nature of the population attending this family practice unit, is supported by these data.

Researcher Effects

Answering questions in the presence of the researcher may have influenced responses. Researcher bias may unconsciously influence respondents to answer in a certain way if they are aware of the purpose of the study. Participants were encouraged throughout the interview to be totally honest in their replies to the questions. There were four homes in which both husband and wife participated in the study. In each case, one spouse went into another room while the other was being interviewed.

Sample Size

The size of this sample was small and therefore limits discussions of outcomes. The sample did permit testing of the instruments in the elderly Newfoundland population. A larger sample would have added more statistical power and significant strength to the results (Shott, 1990). Ideal sample size would be dependent on desired confidence interval sought and number of variables studied. It was possible that Type II error could have occurred as well due to the lower sample size; meaning that a significant relationship did exist but was falsely rejected (Polit & Hungler, 1991).

Summary

This chapter has discussed the results of the research study by reviewing the data and analysis in light of the relevant literature. Nine of the ten selected components of the Health Belief Model chosen for this study did

not reveal a significant relationship with adherence to antihypertensive medications in the group. These were discussed in light of the relevant literature. The significant relationship between General Health Threats and adherence to antihypertensive medications was not as predicted by the Health Belief Model; higher feelings of health threat were associated with less adherence. The Health Belief Model was, therefore, unsupported by this research study however confidence interval data suggest conclusions may be difficult due to the wide intervals found.

The significant relationship between mean diastolic blood pressure and adherence to antihypertensive medications suggests blood pressure control may be an indicator of adherence however the influence of other treatment modalities was unknown for this sample. Limitations of the study are in keeping with other researchers in this field; need for greater psychometric strength of Health Belief Questionnaire and improved methods of measuring adherence. The next chapter will summarize the findings of this study, implications for nursing practice, education and research and offer future recommendations.

CHAPTER VIII

Conclusions, Nursing Implications and Future Research

Conclusions

A convenience sample of 51 elderly Newfoundland residents who regularly attended a Family Practice Service of a teaching hospital were interviewed to test the significance of selected elements of the Health Belief Model in relation to adherence to antihypertensive medications. Adherence was determined using a combination of methods consisting of a chart review, examination of medication labels, pill count, and structured interview conducted in the participants home. Only 43% of the sample adhered to antihypertensive medications. Four patterns of nonadherence were assessed. Under use of medication was the most common pattern observed, accounting for 73.3% of all medication misused in the sample.

Ten factors, identified in the Health Belief Model, were examined to determine if a significant relationship existed between each and adherence to antihypertensive medications. Four of these variables were health beliefs while six others were modifying and enabling factors identified in the model. The four beliefs examined were General Health Threats, General Health Concerns, Susceptibility, and Medical Benefits. The modifying and enabling factors examined included age, gender, income, education, duration of hypertension and length of time taking antihypertensive medications.

A significant negative relationship was observed between adherence to antihypertensive medications and General Health Threats ($p = .004$).

General Health Concerns, Susceptibility, and Medical Benefits were not significantly related to adherence to antihypertensive medications. None of the modifying and enabling factors examined in the study were significantly related to adherence to antihypertensive medication.

Difficulties were experienced with adapting the Health Belief Scales to the Newfoundland elderly population as the applicability of certain items was questioned. This would suggest that measurement tools for health beliefs may need further scrutiny before valid and reliable instruments can be adapted to the Newfoundland population. Further refinement in the Health Belief Scales is recommended before studies using a larger sample are conducted to reflect Canadian health care realities. Based on the empirical evidence presented through the literature discussed and the results of this study, the validity of the Health Belief Model itself was also questioned as a predictor of adherence to long term medications as others have suggested (DeVon & Powers, 1984; Cronin, 1986).

Difficulties with medication assessment in the context of chronic illness were also experienced, although many efforts were taken to validate the accuracy of the data collected by drawing information from various sources. Valid and reliable methods for assessment of adherence are essential in determining factors which influence it. The challenge continues to improve methods for accurately assessing adherence to medications in chronic illness.

Mean diastolic blood pressure was positively and significantly

associated with adherence to antihypertensive medications. It was assumed that individuals who were adherent with their antihypertensive medication regimen, should have a controlled blood pressure. Other variables such as diet, exercise, or weight were not controlled in the study so their influence on hypertension was not known.

The Health Belief Model was not well supported by the empirical findings of this study, as a plausible model for the understanding adherence to antihypertensive medications in elderly clients. Only one of ten selected variables tested resulted in a significant relationship with adherence to antihypertensive medications. The Model contained several other variables which were not tested in this study and were not evident in the literature as being tested by other researchers. These included motivators such as positive health activities, structural factors such as severity of side effects, attitudes toward health care personnel, and enabling factors such as social pressure.

Some researchers favoured improving the instruments used to measure components of the Model rather than seeking improvements in the Model itself. The challenge of finding valid and reliable instruments to measure health beliefs was found in this study as well as by other researchers as previously discussed. Other researchers, including some of those originally included in the development of the Model, saw weakness in the omission of such variables as " the habitual component" (Becker, 1985, p.544) of behaviour whether productive or counter productive; behaviours

carried out for nonhealth-related reasons such as social approval; and the presence of economic or environmental factors which may negate or deter from the adherent behaviour. Other issues such as multiple health problems and success of treatment in complex cases were not addressed by the model. Becker (1985) also acknowledged that the entire model was "predicated on a premise that health is a highly valued concern" (p.544). For the elderly population used in this study, many of whom had multiple chronic health problems, the value of health may indeed be different from a younger population or one with no other chronic diseases.

The findings of this study suggest limited strength of the Health Belief Model in understanding adherence to antihypertensive medications. Although reliability and validity of the four Health Belief Scales are not ideal, other valid and reliably measured factors such as age, education, gender, duration of hypertension and length of time taking antihypertensive medications showed no significant relationship to adherence to antihypertensive medications.

Implications for Nursing Practice

The process of conducting this study revealed the ongoing complexity of assessing adherence to antihypertensive medications in the elderly and determining factors which may be related to it. Nurses practise in a variety of settings dealing with clients taking a wide variety of medication regimens. Excluding institutionalized elderly, the majority of elderly are responsible for the management of their own medications. Nurses must be aware of the

prevalence of cardiovascular disease and hypertension in the elderly population in Newfoundland, and the large percentage of elderly who actually live in the community and manage their own medications. Nurses must be aware of the high rates of non-adherence when planning care strategies. They should become more involved, therefore, in assessing, planning, intervening, and evaluating adherence to antihypertensive medications with their clients as they are the front line workers caring for elderly people in their homes. Predicting which patients are at high risk for nonadherence would allow more focused patient care and wiser use of limited health resources. Identifying key indicators of nonadherence would facilitate this care however further research is still needed to help identify research based interventions.

With the movement towards reduced hospital stays, expanded home services, and greater emphasis on self care initiatives, combined with an aging population with increasing prevalence of chronic illness, the role of nursing personnel in all settings is changing. Nurses must continuously evaluate the abilities of their patients to manage both simple and complex treatment regimens and their responses to these regimens.

This study also has implications for nursing education and research. Nursing educators must encourage students to challenge models of practice and seek validation of their constructs before applying them to nursing practice. Students should explore conceptual models for goodness of fit to their patient population. Nurse researchers must work collectively with other

health professionals to gain greater understanding of adherence to therapeutic regimens in chronic illness. Adherence is a goal shared by all health professionals but will not occur if it is not also the goal of the patients as well. Patient involvement in design and approach to adherence research may assist focusing energy in more appropriate directions. Further examination of quality of life in relation to adherence choices among elderly with chronic illness is an area generally untapped in the research field and one that may provide tremendous insight into this issue. Testing of other conceptual models such as the Self Efficacy Theory briefly discussed herein should also be pursued in combination with the Health Belief Model to determine if collectively they help understand adherence behaviours. Nurses, working with community based elderly, are in an opportune position to identify novel and untested hypothesis about improving adherence and testing these ideas.

This study investigated the influence of several factors on adherence to antihypertensive medications. The significance of these factors has been debated in the literature with no consistent results produced. Age, education, economic status, and gender were not related to adherence to antihypertensive medications in this elderly sample. Health beliefs, with the exception of General Health Threats, did not illustrate significant relationships to adherence. Limitations of the study may have contributed to the outcomes of the study, however, and further refinement of instruments may yield different findings. This study illustrated the difficulty and possible

sources of error in assessing adherence to medication regimens in chronic illness.

Future Research Recommendations

This study identified a significant relationship between one variable of the Health Belief Model, General Health Threats, and adherence to antihypertensive medications. No other significant findings were found to support the influence of health beliefs on adherence to antihypertensive medications. Mean diastolic blood pressure was significantly associated with adherence to hypertensive medications suggesting that those who take their antihypertensive medications as prescribed are more likely to have controlled blood pressure.

The study has highlighted some of the issues which arise when adapting instruments and research methods. The need for improved accuracy in measuring adherence is crucial if researchers are to investigate the influence of various strategies on it. Adapting other research instruments, designed for other populations or health care systems, must be validated in each new research population. Questions may reflect a different cultural philosophy or a different method of expression and therefore yield a significantly different outcome. The elderly Newfoundland population in the study, for example, may not be typical of their rural, urban or even Canadian peer group. Future research on the Health Belief Model in this population may assist in further refinement of the instruments chosen for this study or the design of more culturally sensitive ones. The Medical Benefits Scale, for

example, should be more in keeping with issues which relate to the perceived benefits of the patient - physician relationship, confidence in the recommended treatment, and perceived success or failure of the treatment. Qualitative interviews to explore values and concerns in this population would allow development of a more sensitive questionnaire followed by factor analysis on a representative group.

The relationship between adherence and health indicators, such as control of blood pressure, quality of life, and reduced mortality is also an area requiring more extensive research. Studies which examine improved survival, quality of life, or costs of health care in relation to adherence must become part of the knowledge base in our understanding of adherent behaviours.

Qualitative research which approaches adherence from the patients perspective is a plausible approach to understanding adherence to medication regimens in chronic illness (Roberson, 1992; Thorne, 1990). Research, using a variety of methods, can provide valuable insight into the experiences and influencing factors affecting adherence.

Summary

The purpose of this study was to identify the relationship between selected factors of the Health Belief Model and adherence to antihypertensive medications in a population of Newfoundland seniors. General Health Threats and mean diastolic blood pressure were significantly associated with adherence to antihypertensive medications. Further

refinement of tools to assess adherence, adaptation of health belief instruments to the target population, exploration of other plausible conceptual and empirically tested models, and greater focus on health indicators must be priorities in future research.

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Memorial
University of Newfoundland

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

Appendix A

TO: Ms. Regina Coady, c/o Staff Development, General Hospital

FROM: Assistant Dean, Research and Graduate Studies (Medicine)

SUBJECT: **Application to Human Investigation Committee - #1082**

The Human Investigation Committee of the Faculty of Medicine has reviewed your proposal for the study entitled **"Factors Influencing Medication Taking Practices of a Sample of Newfoundland Elderly with Hypertension"**.

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

It will be your responsibility to seek necessary approval from the Hospital(s) wherein the investigation will be conducted.

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

C. J. Michalski, Ph.D.

cc: Dr. Lan Gien, Supervisor

Dr. N. Gogan
Associate Vice-President (Research)

Dr. F. Bursey, HIC Representative
General Hospital

Dr. E. Parsons, Medical Director
General Hospital

St. John's, Newfoundland, Canada A1B 3V6 Telex: 016-4101 Tel.: (709) 737-6762

Appendix B

Letter To Family Practice

St. John's, Newfoundland
1992 05 11

Chairperson
Research and Development Committee
Family Practice Unit

Dear

I am a registered nurse and a graduate student in the School of Nursing at Memorial University. I am currently in the planning phase of my research theses proposal. I will be examining the factors influencing adherence to medication regimens in a sample of hypertensive elderly Newfoundland residents.

I am writing you at this time to formally request permission to access patients through your family practice unit. I met informally with Dr. Carl Robbins on April 2, 1992 at which time he suggested contacting you as the chairperson of the Research Committee. We discussed the practical and ethical considerations of this study and it was felt that it will provide vital and functional information to both our disciplines. It will also have utility to health care professionals in other centres across Newfoundland dealing with the growing population of elderly hypertensives.

I would need assistance in the identification of approximately 100 elderly people over the age of sixty-five who have a diagnosis of primary hypertension and who are receiving prescribed anti-hypertensive medications.

I would need access to patients charts in order to identify previous documentation of hypertension and collect information about medications prescribed. Suitable participants will be initially contacted by letter from your physicians inviting participation in this study. A follow up by telephone will be conducted by the researcher to explain further the purposes of the study and to seek confirmation for their participation in the project. If he\she agrees, an appointment is made for a home visit where further explanation about the project is done and consent form is signed. Subsequently the interview will be carried out.

Enclosed is a copy of my research proposal for your information. I will be happy to see you to further discuss about the project and the possible way to identify suitable participants for the study.

I look forward to your serious consideration of this request. Application to the Human Investigation Committee has also be completed. Please contact me for further information or clarification of any matter discussed within this letter. You may call me at home 368-9911, work 737-7185, or leave a message with my thesis supervisor Dr. Lan Gien at the Memorial University

School of Nursing 737-6695. Dr. F. G. Fodor in the Division of Community Medicine, and Ms. Donna Best in the School of Nursing are also on my thesis committee and will assist me through the data collection and analysis.

Sincerely,

Regina Coady

Appendix C

Letter to Attending Physicians

To: Dr. -----
From: Regina Coady
Date: ----------
Re: Patient Interviews for research study

.....

Thank you for agreeing to participate in the study **Factors influencing medication taking practices of a sample of Newfoundland elderly with hypertension.** The following patients were identified as having been seen by you. They were identified as both hypertensive and over sixty five years of age on the computer printout received from the Computer Services Department:

-
-
-

Before entering this study patients must also 1) be hypertensive and taking medication for their hypertension for at least one year, 2) be mentally competent [ie. be able to complete the interview], and 3) be English Speaking.

I would appreciate discussing these patients with you at your earliest convenience regarding their eligibility for the study. Contact will be made with those patients meeting all criteria.

I can be reached during business hours at 737-7185 or at home after hours at 368-9911.

Sincerely,
Regina Coady RN BN

Appendix D

Letter to Potential Participant

Dear _____ ,

You are invited to participate in a research project currently being conducted on seniors who attend our clinic and have high blood pressure.

The purpose of the study is to examine the factors that you feel influence your decisions to take your medications for high blood pressure. The results of the study will assist health care workers identify ways to improve the care of Newfoundland seniors with high blood pressure .

A nurse researcher, Regina Coady RN BN is conducting this study. She is currently studying towards her Masters in Nursing. If you agree, she will contact you by telephone to speak to you about this study and answer any questions you may have.

All information will remain confidential. Your name will not be recorded. The interview will take approximately one hour. You will be asked questions about your health and medications. Your blood pressure will be checked and your pill bottles examined.

If you are willing to speak to Ms. Coady about the study please leave a message at the Family Practice Unit at the Health Science Centre where you normally make your appointments.

Sincerely,

_____

(Name of Family Physician)

Appendix E

Informed Consent Form

Title: Factors influencing medication taking practices of a sample of Newfoundland elderly with hypertension.

Investigator: Regina Coady BN RN Master's Candidate

You have been asked to participate in a research study. Participation in this study is entirely voluntary. You may decide not to participate or may withdraw from the study at any time without affecting your normal treatment.

Confidentiality of information concerning participants will be maintained by the investigator. The investigator will be available at all times should you have any problems or questions about the study.

The purpose of this study is to identify factors which you feel influence your medication taking practices particularly those medications which relate to your high blood pressure. With your consent, a one hour interview will be set up in your home during which questions will be asked about your medication taking practices. Your blood pressure will be checked and your pill bottles will be examined. There are no risks involved. The results of this study will assist health care workers identify ways to improve the care of Newfoundland seniors with high blood pressure.

I _____, agree to participate in the research study described. Any questions have been answered and I understand what is involved in the study. I realize that participation is voluntary and that there is no guarantee that I will benefit from my involvement. I acknowledge that a copy of this form has been offered to me.

_____ _____

Signature of Participant Date

To be signed by the investigator

To the best of my ability I have fully explained to the subject the nature of this research study. I have invited questions and provided answers. I believe that the subject fully understands the implications and voluntary nature of the study.

_____ _____

Signature of investigator Date

Appendix F

Modified Weissfeld, Kirscht, and Brock Health Belief Scale*

KEY: 1 = MORE/ VERY/ ALWAYS; 2 = AS MUCH AS / SOMEWHAT/ SOMETIMES;
3 = LESS / A LITTLE/ RARELY; 4 = MUCH LESS / NOT AT ALL/ NEVER; 5 = DON'T KNOW

General Health Concerns

(1) How often do you think about your health? 1 - 2 - 3 - 4 - 5
(1)always (2)sometimes (3)rarely (4)never (5) don't know

(2) How concerned are you about your health? 1 - 2 - 3 - 4 - 5
(1)very (2)somewhat (3)a little (4)not at all (5)don't know

(3) How important do you think it is that
people take special care of their health? 1 - 2 - 3 - 4 - 5
(1)very (2)somewhat (3)a little (4)not at all (5)don't know

(4) How concerned are you about the possible future
effects of high blood pressure on your health? 1 - 2 - 3 - 4 - 5
(1)very (2)somewhat (3)a little (4)not at all (5)don't know

General Health Threat

(5) Compared to other people your age, would you
say that you get sick more often...? 1 - 2 - 3 - 4 - 5
(1)more (2)as much as (3)less (4)much less (5)don't know

(6) When you do get sick, would you say you
get sicker than others your age? 1 - 2 - 3 - 4 - 5
(1)more (2)as much as (3)less (4)much less (5)don't know

Susceptibility

(7) One year from now, how likely do you think
that your blood pressure will not be in good control? 1 - 2 - 3 - 4 - 5
(1)very (2)somewhat (3)a little (4)not at all (5)don't know

(8) How likely is it that you will have other health problems
in the future arising from your high blood pressure? 1 - 2 - 3 - 4 - 5
(1)very (2)somewhat (3)a little (4)not at all (5)don't know

(9) How serious a health problem do you think high blood
pressure will be for you in the future? 1 - 2 - 3 - 4 - 5
(1)very (2)somewhat (3)a little (4)not at all (5)don't know

Medical Benefits

(10) Overall, how helpful are the doctors when you are ill? 1 - 2 - 3 - 4 - 5
(1)very (2)somewhat (3)a little (4)not at all (5)don't know

(11) Overall, how effective do you think blood pressure medicines are in preventing illness from the effects of high blood pressure? 1 - 2 - 3 - 4 - 5
(1)very (2)somewhat (3)a little (4)not at all (5)don't know

(12) How important do you think controlling blood pressure is? 1 - 2 - 3 - 4 - 5
(1)very (2)somewhat (3)a little (4)not at all (5)don't know

(13) Overall, how easy or difficult is it to get medical care when you want it? 1 - 2 - 3 - 4 - 5
(1)very (2)somewhat (3)a little (4)not at all (5)don't know

* Modified From "Health beliefs in a population: The Michigan blood pressure survey" by J. L. Weissfeld, J. P. Kirscht, and B. M. Brock, 1990, Health Education Quarterly, 17(2), 153-154.

Appendix G

Medication Evaluation Record

Tell me the name of all the drugs that you are taking.	For what problem are you taking this drug?	Are you taking this medication now?	How often?	Any special precautions?	Date filled	No. of pills left	reason for pres. drug (chart)	Instr. (chart)	pattern as judged by worker

Appendix H

General Questionnaire

Blood pressure - sitting (measure #1)_____

Blood pressure - sitting (measure #2)_____

Blood pressure on last visit to doctor_____ (chart)

How long have you had high blood pressure?

___0 to <5 yrs (1); ___ ≥5 to <10 yrs (2); ___ ≥10 yrs(3).

How long have you been taking medications for your blood pressure?

___0 to <5 yrs (1); ___ ≥5 to <10 yrs (2); ___ ≥10 yrs(3).

Age _____

Gender M___(1) F___(2)

Highest Level of Education Grade 0-3 ___(1); 4-8___(2); 9-12___(3); 13 and over____(4)

Degree/diploma held _____

Occupation most of your life_____

Average annual household income < 10,000 ___; ≥10,000 to < 20,000 ___;
≥ 20,000 to < 30,000 ___; ≥30,000 ___

Appendix I

Weissfeld, Kirscht, and Brock Health Belief Scale: Factor Analysis Scores**

General Health Concerns

(1) How often do you think about your health?	.58
(2) How concerned are you about your health?	.74
(3) How important do you think it is that people take special care of their health?	.28
(4) How concerned are you about the possible future effects of high blood pressure on your health?	.50

General Health Threat

(5) Compared to other people your age, would you say that you get sick more often...?	.34
(6) When you do get sick, would you say you get sicker than others your age?	.23

Susceptibility

(7) One year from now, how likely do you think that your blood pressure will not be in good control?	.38
(8) How likely is it that you will have other health problems in the future arising from your high blood pressure?	
(9) How serious a health problem do you think high blood pressure will be for you in the future?	.37

Medical Benefits

(10) Overall, how helpful are the doctors when you are ill?	.25
(11) Overall, how effective do you think blood pressure medicines are in preventing illness from the effects of high blood pressure?	.70
(12) How important do you think controlling blood pressure is?	.18
(13) Overall, how easy is it to get medical care when you want it?	.18

** From "Health beliefs in a population: The Michigan blood pressure survey" by J. L. Weissfeld, J. P. Kirscht, and B. M. Brock, 1990, Health Education Quarterly, 17(2), 153-154.

Appendix J

Original Weissfeld, Kirscht, and Brock Health Belief Scale

General Health Concerns

(1) How often do you think about your health?
(2) How concerned are you about your health?
(3) How important do you think it is that people take special care of their health?
(4) How concerned are you about the possible future effects of high blood pressure on your health?

General Health Threat

(5) Compared to other people your age, would you say that you get sick more often...?
(6) Compared to other people your age , when you do get sick, would you say you get much more sick...?

Susceptibility

(7) One year from now, how likely do you think that it is that you will have elevated blood pressure levels where your pressure is not in good control?
(8) How likely is it that you will have a heart attack in the future?
(9) How likely is it that you will have kidney disease in the future?
(10) How likely is it that you will have a stroke in the future?
(11) How likely is it that you will have cancer in the future?

Severity

(12) How serious a health problem do you think high blood pressure will be for you in the future?
(13) How serious a health problem would having a heart attack be for you?
(14) How serious a health problem would having a stroke be for you?
(15) How serious a health problem would having kidney disease be for you?
(16) How serious a health problem would having cancer be for you?

Medical Benefits

(17) Overall, how helpful are the doctors when you are ill?
(18) Overall, how effective do you think blood pressure medicines are in preventing illness from the effects of high blood pressure?
(19) Overall, how effective do you think medical,treatment is in preventing illness from the effects of high blood pressure?
(20) What about special diets?
(21) What about exercise programs for high blood pressure?
(22) How important do you think controlling blood pressure is?
(23) Overall, how easy is it to get medical care when you want it?

Self-Help Benefits

Now I will read you a list of things some people think help their health. Tell me if you think each one I read helps a person's health a great deal...?

(24) ...eating a good breakfast?
(25)...getting regular physical activity?
(26)...being at the ideal weight for a persons height?
(27)...avoiding getting tense and anxious?
(28)...getting regular medical checkups?
(29)...getting the right amount of sleep?
(30)...avoiding cigarettes?
(31)...avoiding alcohol?
(32)...leading a spiritual life?

From "Health beliefs in a population: The Michigan blood pressure survey" by J. L. Weissfeld, J. P. Kirscht, and B. M. Brock, 1990, Health Education Quarterly, 17(2), 153-154.

Appendix K

List of Antihypertensive Medications Prescribed for the Sample

Beta blocker
Atenolol
Metoprolol/Lopressor/Aldoril/Novometoprol
Sectral/Monitan
Pindolol
Corgard
Inderal/Propranolol

ACE Inhibiter
Accupril
Prinivil
Vasotec/Enalapril
Monopril
Captopril

Calcium Channel Blocker
Adalat
Felodipine
Plendil
Cardizem/Diltiazem
Novoverapamil/Isoptin

Central Acting Agent
Aldomet

Combination
Vaseretic

Nitrate
Isordil

Alpha Blocker
Terazosin

Diuretic
Lozide
Hydrochlorothiazide/Hydrodiuril
Lasix
Midamor
Dyazide/Triamizide
Naturetin
Semide

Appendix L

Letter of Permission to Use Weissfeld, Kirscht, and Brock Health Belief Scale

Pittsburgh Cancer Institute

A National Cancer Institute-Designated Comprehensive Cancer Center

200 Meyran Avenue
Pittsburgh, Pennsylvania
15213-3305
412/647-2072
Telex No. 199-126
Fax No. 412/621-9354

PCI Cancer Information and Referral Service (CIRS)
800/537-4063

March 23, 1992

Regina Coady
24 Royal Oak Drive
St. John's, Newfoundland
A1G 1S2

Dear Ms. Coady:

I am enclosing a copy of the survey instrument from which I selected items for my HSR article. You should be able to identify the items used in the analyses by comparing the survey instrument and descriptive information included in the Appendix to my article.

I am no longer actively working with the Health Beliefs Model (HBM) or in the health education field. It is my impression that most investigators in this field are somewhat discouraged by limited explanatory power provided by the Health Beliefs Model (HBM). When I was actively working in this area, it was my impression, as well, that a standard for measuring HBM constructs remained an unrealized goal.

The items generally used to measure HBM constructs have a great deal of face validity. The HBM constructs harmonize with the content of most cognitive health education interventions. For these reasons, the HBM carries considerable appeal for health educators. Other models may have greater theoretical sophistication, explanatory power, or psychometric rigor.

Sincerely,

Joel L. Weissfeld, M.D., M.P.H.

enclose: U of M Blood Pressure Survey