Antihypertensive Drug Use in Diabetic Seniors:

A Descriptive Population-Based Study of the Nova Scotia Seniors' Pharmacare Administrative Claims Data, 1989 to 1995.

by

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Dedication

I would like to dedicate my thesis to my daughter, Natalie Lorna, who was born on November 8, 1998, to my husband Michel, and my parents, Ches and Linda.

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Abstract

Background: Population-based studies which examine the appropriateness of drug use are needed. Few studies have been conducted due to a lack of readily available, sufficient or detailed patient level characteristics. A method that identifies a population with specific disease or risk factors could augment the examination of appropriate drug use at the population level. This study examines the use of antihypertensive drugs in a diabetic population, 65 years of age and over. Hypertension and diabetes mellitus are major risk factors for coronary heart disease and stroke, and in combination have a large burden of illness in seniors. In Canada, angiotensin converting enzyme inhibitors (ACEIs), calcium channel blockers (CCBs) and alpha-blockers are recommended for the first-line treatment of hypertension complicated by diabetes.(Dawson KG, et al. CMAJ 1993;149:821-826.) Little is known about the existing pattern of drug use or the potential over or under use of antihypertensive drugs in diabetic seniors. **Objective**: To describe the trends in antihypertensive drug use in the Nova Scotia diabetic senior population, between fiscal years 1989 and 1995. **Design**: All claims (N =851,260) for drugs approved for the treatment of hypertension were obtained from the Nova Scotia Seniors' Pharmacare Program between April 1, 1989 and March 31, 1996 for seniors with diabetes mellitus (N = 22,451). Diabetic seniors were identified using a previously validated administrative case definition based on linked drug, physician services and hospital separations data. **Main Outcome Measure**: Drug use was measured as the age-sex adjusted number of drug users per antihypertensive drug category per 1,000 diabetic seniors with at least one antihypertensive drug claim per fiscal year (April 1 – March 31). Antihypertensive drug categories represent the use of single-entity drug preparations, excluding drugs used in fixed combinations. **Results**: Results are expressed as the relative percent change between 1989 and 1995 (users per 1,000 in 1989; users per 1,000 in 1995). Use in the following categories increased: ACEIs: 83%(216;396); CCBs: 42%(289;410); High Ceiling Diuretics: 1.2%(264;267); Beta-Blockers(BBs): 6%(318;337); Low Ceiling Diuretics: 0.1%(167;167). Use in the following categories declined: Fixed Antihypertensive Combination Preparations: 48%(388;202); Antiadrenergics: 44%(135;76); Potassium Sparing Diuretics: 28%(26;19). **Conclusion**: ACEIs were used by only 40% of diabetic seniors with at least one antihypertensive drug claim in 1995. ACEIs may potentially be underused in this diabetic senior population. Further study is required to determine the economic implications and health benefits of new and anticipated trends in antihypertensive drug use in seniors with diabetes. The study of antihypertensive drugs used by diabetics augmented the examination of trends in drug use in the Nova Scotia senior population. However, the lack of key clinical variables continues to limit examination of trends in antihypertensive drug use for potential appropriateness.

List of Abbreviations and Symbols Used

ACEI	Angiotensin Converting Enzyme Inhibitor
AH	Antihypertensive
ATC	Anatomical Therapeutic Chemical Index of the World Health Organization
AT_1	Angiotensin Type 1 Receptor
BB	Beta-blocker drugs
C$	Canadian Dollars
CCB	Calcium Channel Blocker drugs
CAD	Coronary Artery Disease
CHD	Coronary Heart Disease
CHF	Congestive Heart Failure
DDD	Defined Daily Dose
DIN	Drug Identification Number
ESRD	End-Stage Renal Disease
FY	Fiscal Year
G	Gram
GIS	Guaranteed Income Supplement
HDL	High Density Lipoprotein
ICD-9	International Classification of Disease. 9th Edition
INJ	Injection

ISH	Isolated Systolic Hypertension
JNCVI	Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure, Sixth Report.
LIQ	Liquid
ML	Millilitre
mmHg	Millimetres of Mercury
MSI	Medical Services Insurance Program
N	Number
NS	Nova Scotia
Non-GIS	Non-Guaranteed Income Supplement
PHRU	Population Health Research Unit, Dalhousie University
PMPRB	Patented Medicine Prices Review Board
RAMQ	Régis de l'assurance-maladie du Québec
SC	Subcutaneous
SD	Standard Deviation
SRC	Sustained Release Capsule
SRT	Sustained Release Tablet
SUSP	Suspension
TAB	Tablet
Type I	Type I Diabetes Mellitus

Type II	Type II Diabetes Mellitus
U	Units
UKPDS	United Kingdom Prospective Diabetes Study
WHO	World Health Organization
%	Percent
®	Registered Trade Mark
™	Trade Mark

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Introduction

Population-based trends in drug use have important implications for patient health outcomes, drug treatment and other health services. Several population-based studies have examined trends in drug use[1-5]; however, few of these studies have examined the appropriateness of trends. To do so requires sufficient information on patient level characteristics that are suitable for determining appropriateness of treatment. While such detailed data are not readily available at the population level, subgroups of patients with specific diseases or risk factors or their combination can be examined. By so doing, trends can be better examined for appropriateness relative to changes in consensus for drug treatments.

This study examines trends in the use of drugs indicated for the treatment of hypertension among seniors with diabetes mellitus. Hypertension and diabetes are both major modifiable risk factors of coronary heart disease and stroke.[6-9] In addition, hypertension is both a risk factor and a complication of diabetes.[7,10] Both diseases cause significant morbidity and mortality in seniors, and in combination have a large burden of illness.[7,8,11] New evidence has led to new recommendations regarding the use of antihypertensive drugs in seniors, and more specifically in persons with diabetes to improve the outcomes of diabetic complications.[6,9,12,13] Trends in antihypertensive drug use can be examined for potentially inappropriate selection of drugs generally not recommended for use in diabetics and for potentially underused drugs based on new recommendations.

The population-based use of antihypertensive drugs is reported in Nova Scotia and other jurisdictions; however, the ability of investigators to examine trends for appropriateness relative to recommendations for treatment of hypertension has been limited.[1-4] This study refines the methods used by other researchers to investigate population-based trends in

drug use and contributes new knowledge regarding drug use in diabetic seniors. This study provides information to seniors, health care professionals, educators, researchers, governments and insurance providers. The data may signal the need for funding and resources to (1) evaluate the health and economic outcomes resulting from policies and clinical interventions, (2) develop methods which optimize physician prescribing, patient compliance, and health outcomes, and (3) assist with forecasting of needed future drug expenditures which optimize drug-related health outcomes in persons with diabetes.

This study proposes to measure the trends in antihypertensive drug use among seniors with diabetes mellitus who were beneficiaries of the Nova Scotia Seniors' Pharmacare Program between April 1, 1989 and March 31, 1996. The objective of this study was to determine if the type of antihypertensive drugs prescribed for diabetic patients has changed over time as new drugs, new drug formulations and new evidence has emerged.

Objective

To describe trends in antihypertensive drug utilization among persons with diabetes mellitus who were beneficiaries of the Nova Scotia Seniors' Pharmacare program and received antihypertensive drugs commonly indicated for the treatment of hypertension between April 1, 1989 and March 31, 1996.

Background

Burden of Illness

Hypertension is among the most frequently treated health conditions and is responsible for half of all cardiovascular related physician visits in Canada, for persons of all ages.[14]

Hypertension (elevated systolic blood pressure ≥ 140 mmHg or diastolic blood pressure ≥ 90 mmHg) affects approximately 52% of men and 58% of women in Canada aged 65 to 74.[9,15-18] In Nova Scotia, the prevalence rate of hypertension is 59% in seniors.[18] Recent evidence in both Canada and the United States suggests the awareness of hypertension is decreasing and is poorly controlled in seniors.[17-21] The Canadian Heart Health Surveys reported only 41% of seniors between 65 to 74 years of age, who were treated (pharmacologically or nonpharmacologically) for high blood pressure, were controlled. (N = 858/2,091).[17] Poor control of hypertension in diabetic seniors is a significant risk for further development of cardiovascular disease and diabetic complications.

In and of itself, diabetes has a high prevalence among seniors relative to the general population and is a significant cause of morbidity and mortality in seniors.[7] The prevalence of diabetes in seniors is reported to be between 10% (age-standardized, 1991 Canadian General Social Survey) and 11% (1995 Nova Scotia Health Survey).[18,22] However, up to half of seniors with diabetes may remain undiagnosed and untreated resulting in a population prevalence rate closer to 20%.[14,18,23,24] In contrast, the prevalence of diabetes in the general Canadian population is estimated to be between 2% and 2.7%[25], and as high as 5% in persons 18 years of age and over.[14,26] Higher rates have been reported in native populations.[7,27] Type II diabetes is the most common form of diabetes in seniors, accounting for 92% of cases in seniors and 85% of cases for all ages.[28] Diabetes was responsible for 2% of all deaths in Canada in 1994 and was the 8th ranked cause of death for adults of all ages in 1995.[29,30] Persons with diabetes are reported to have a four-fold risk of developing cardiovascular related morbidity and mortality compared to age-sex matched non-diabetic persons.[6] Age-standardized mortality due to diabetes has increased since the 1980's.[6,7] In 1996, the overall age-standardized mortality rate for diabetic men was 20.4/100,000 and for diabetic women was 14.1/100,000.[7] In contrast, mortality for cardiovascular disease has decreased in the general population, most likely due to better treatment and management of risk factors.

The increase in mortality due to diabetes may be due to the increased prevalence of diabetes and its major risk factors such as obesity.[7]

Diabetes mellitus and hypertension frequently occur in combination, and have a large burden of illness. Diabetes and hypertension are two of the major modifiable risk factors for coronary heart disease that cause significant morbidity and mortality both individually and in combination particularly in seniors, 65 years of age and older.[9] Hypertension is both a risk factor and a complication of diabetes.[7,10] Type I diabetics usually develop hypertension over their lifetime whereas hypertension often precedes type II diabetes as a component of Syndrome X (i.e. insulin resistance syndrome, metabolic syndrome).[31] Syndrome X is characterized by obesity, hypertriglyceridemia, low levels of HDL (high-density lipoprotein), hyperinsulinemia, impaired glucose tolerance and hypertension. [31-33] Hypertension in combination with diabetes reduces life expectancy, by causing coronary heart disease (CHD) and stroke, and accelerates all vascular complications associated with diabetes.[12,15,34]

In general, Canadian mortality due to CHD has decreased 4% and that due to stroke has decreased 2% per year on average since 1984.[11] However, CHD was still the leading cause of hospitalization and death among Canadian seniors between 1984 and 1993 and the highest rates of mortality due to CHD were reported in Eastern Canada (which includes the province of Nova Scotia).[11] The decrease in mortality due to stroke has been attributed to better blood pressure control, treatment, and awareness; however, stroke remains the third ranked cause of death among men and the second ranked cause of death among women who are 65 years of age and older.[11] The costs of cardiovascular disease and diabetes are high, accounting for 15.2% and 0.9% respectively, of total 1993 direct and indirect health costs in Canada.[35] Persons with diabetes have higher hospitalization rates, longer hospital stays and more ambulatory care visits than those without diabetes.[23,36]

In addition to being major risk factors for coronary heart disease, diabetes and hypertension are also major risk factors for end-stage renal disease. End-stage renal disease is characterized by high mortality, morbidity and high treatment costs that are associated with renal replacement therapy.[12,37] Diabetes is the leading cause of end-stage renal disease, and hypertension with diabetic nephropathy occurs in approximately 40% of type I diabetics and 20-30% of type II diabetics also "develop clinically important nephropathy".[38] Hypertension in itself, is the second most common cause of end-stage renal disease, and further accelerates progression of renal disease in persons with diabetes.[9,39-41] The prevalence of end-stage renal disease is increasing in the general population of both Canada[37] and the United States.[9] Although reasons for the increase in end-stage renal disease are unknown, contributing factors may be the increased prevalence of diabetes, type II in particular, and increased survival in diabetics with coronary artery disease who may then develop end-stage renal disease as they age.[13,37,38] The rising prevalence of uncontrolled hypertension in seniors may also contribute to this trend.[17,18]

Antihypertensive Drug Use

The population-based use of antihypertensive drugs is reported in Nova Scotia and other jurisdictions, however, the ability of investigators to examine trends for appropriateness relative to recommendations for treatment of hypertension has been limited.[1-4] Trends in antihypertensive drug use in seniors were examined using Nova Scotia's administrative Pharmacare databases between 1989 and 1995. However, data indicating the reason for drug use were not available to examine the appropriateness of trends in antihypertensive drug use.[1] The self-reported use of antihypertensive drugs for the treatment of hypertension was also studied for participants (aged 25 to 74) in the population-based, Halifax County, Nova Scotia MONICA Area Surveys in 1985 and 1995.[2,3] Data for the

1985 and 1995 MONICA Surveys were also pooled with the 1985 and 1995 Nova Scotia Health Surveys, for Halifax County residents aged 25 to 74 years, to examine the drug treatment of hypertension. However, the number of persons with comorbidities was insufficient to study antihypertensive drug use in comorbid diseases.[4]

Guidelines in both Canada and the United States recommend angiotensin converting enzyme inhibitors, calcium channel blockers, and beta-blockers for first-line treatment for the treatment of hypertension in persons with diabetes.[9,42] Low dose diuretics are also considered first-line in the most recent guidelines of the Canadian Diabetes Association and the American JNC VI.[6,9] The target blood pressure for persons with diabetes is now <130/85 mmHg.[6,9,12] Type I diabetes with proteinuria is now considered a "compelling" indication for treatment with angiotensin converting enzyme inhibitors in all hypertensive patients, without contraindications, to postpone nephropathy.[9,13] The Canadian Diabetes Association also recommends the use of ACEIs in normotensive type I diabetics with microalbuminuria[6] but there is lack of evidence and consensus in both Canada and the United States regarding the optimal selection and timing of antihypertensive drug treatment particularly in normotensive type II diabetics with early signs of nephropathy.[6,8,9,13,43] Furthermore, angiotensin converting enzyme inhibitors need to be used with caution in seniors who already have significant renal disease.[12] Diuretics and beta-blockers have also been recommended for use in elderly diabetics in Canada.[6] Diuretics are the preferred treatment in the elderly without comordid disease[9,42] and beta-blockers have been shown to improve long-term survival in both diabetic and non-diabetic seniors after myocardial infarction.[6,8,12,42] It is important to note that the current Canadian Hypertension Society guidelines[15,42,44,45] were last published in 1993 and therefore do not currently reflect many of these new recommendations. The revised guidelines will be released in 1999 but were not available prior to the preparation of this manuscript. It is interesting to discuss the most recent guidelines and those published in other countries but the most pertinent guidelines for general practice and family

physicians in Nova Scotia include those of the Canadian Hypertension Society[15,42,45,46], the Canadian Diabetes Association[6] and the Diabetes Care Program of Nova Scotia.[12] Furthermore, the guidelines which correspond to the fiscal year of interest should be consulted if the potential appropriateness of trends in drug use is being considered.

Despite the recommendations for their use as second line agents in the treatment of uncomplicated hypertension, there have been large increases in the use and cost of calcium channel blocker and angiotensin converting enzyme inhibitor treatment.[1-4,5,47] There is concern that these drugs are overused in the general population with uncomplicated hypertension, and that high volume prescription use per capita or high expenditures are not always equated with better health outcomes.[4,48-50] In a population based study of persons with hypertension (25 to 74 years of age) in Nova Scotia, Wolf et al. found the relative cost of antihypertensive treatment increased between 1985 and 1995, while control rates in 1995 declined.[4] In the Cardiovascular Health Study, Psaty et al. found seniors in the United States who were started on a new treatment for hypertension, were half as likely to receive diuretics or beta-blockers and twice as likely to receive calcium channel blockers or angiotensin converting enzyme inhibitors which are considerably more expensive treatments.[5] In contrast, a small study in a Canadian family practice setting in Quebec recently found that only 12 of 37 diabetic patients were receiving an angiotensin converting enzyme inhibitor even though this was the most commonly prescribed drug among all patients in the study.[51] Non-dihydropyridine calcium antagonists are also suggested in diabetic nephropathy to slow the progression of nephropathy and improve long-term outcomes [43] and the combination of angiotensin converting enzyme inhibitors and calcium channel blockers may also reduce proteinuria to a greater extent than either drug alone.[9,52] However, these treatments remain controversial due to the lack of sufficient evidence[13,43], and while the optimal level of population drug use is unknown, public and private drug insurers need knowledge of population-based levels of drug use in order to understand the therapeutic outcomes and

cost implications of drug use trends, particularly for widely used and expensive drugs. There is a lack of population-based studies examining the potential underuse of antihypertensive drugs for a specific disease population such as persons with diabetes. Underuse may have significant implications for persons with diabetes in light of emerging evidence regarding the potential for improved survival with the use of angiotensin converting enzyme inhibitors, calcium channel blockers and beta blockers. Good evidence exists for the use of angiotensin converting enzyme inhibitors in type I diabetics with microalbuminuria. Less evidence exists for the use of calcium channel blockers, beta-blockers in both types of diabetics or for the use of angiotensin converting enzyme inhibitors in type II diabetics.[13]

The economic implications of antihypertensive drug use trends are becoming increasingly complex with the addition of new and more expensive drug products and improved survival of patients with various cardiovascular diseases. Drug treatments such as angiotensin converting enzyme inhibitors, may become standard treatment for prevention of end-stage renal disease in diabetics who are at risk. While this may avoid the long-term morbidity and mortality associated with end-stage renal disease treatment costs associated with renal replacement, the immediate increase in drug expenditures will be significant for drug insurers. Cardiovascular drugs, of which antihypertensives are the most commonly prescribed class, were responsible for one-third (C$24.7M) of reported drug expenditures (C$72M) for Nova Scotia Seniors Pharmacare in 1995.[53] Increased drug expenditures are due to many factors including an increase in the proportion of treated population, changes in prescribing, patterns of drug use (i.e. patient adherence, drug type and formulation, dosage, duration of treatment and combination drug therapy), and drug price.[48,54] Many new antihypertensive drugs and drug formulations have been marketed in Canada since 1989. The increasing prevalence of chronic drug-treated diseases such as diabetes and hypertension also indicates that the number of drug-treated

patients is increasing as the population ages. In fact, the number of seniors in Nova Scotia is expected to increase 16% from 120,011 seniors to 139,317 seniors by the year 2008. The increase in seniors represents 91% of the projected total population increase (N = 21,101) for Nova Scotia.[55]

Clearly, there are important links between the optimal management of blood pressure, selection of drug treatment and reduction of morbidity and mortality among seniors with both type I and type II diabetes.[56] Nova Scotia and Canada require good quality population-based data which may be used to improve the way our scarce health care resources are used to treat persons with diabetes. The choice of drug treatment has significant implications for treatment costs and patient health outcomes. We must further examine the implications of drug treatment to develop effective drug related health policies in diabetic seniors and the population in general. The capability for data linkages in Nova Scotia's administrative data may be used to examine antihypertensive drug use in the diabetic population of seniors between 1989 and 1995. This study examines the trends in antihypertensive drug use, with respect to the type of antihypertensive drug to describe how use has changed with the introduction of new drug and recommendations for their use. This descriptive population-based data is needed to further target service delivery, education and research for the diabetic population and their health care providers.

Methods

Data

Three secondary data sources were used in this study. The administrative data of the Nova Scotia Seniors' Pharmacare Program (also known as the Seniors' Pharmacare Drug

Insurance Program) were used to obtain data on drugs used while data on reported medical conditions were obtained from the Nova Scotia's Hospital Separations database and the Nova Scotia Medical Services Insurance Physician Services (MSI) Program. The Population Health Research Unit (PHRU) of the Department of Community Health and Epidemiology, Dalhousie University, Halifax, accesses provincial health services utilization data for research under an agreement with the Nova Scotia Department of Health. Encrypted individual level data were aggregated to the population-level to provide population-based measurement of drug use. The methods used in this study maintained the privacy and confidentiality of individual Nova Scotia seniors. Encrypted individual level data were aggregated to the population-level to provide new knowledge of drug therapeutics in a previously uninvestigated disease population in Nova Scotia. The potential benefits of this knowledge to the collective diabetic population, health care providers, educators and researchers greatly outweighs the unlikely potential to cause individual harm. This study was reviewed and approved by the Human Ethics Review Committee of the Faculty of Graduate Studies.

The Nova Scotia Seniors' Pharmacare administrative database contains drug claims for all beneficiaries with at least one claim in a fiscal year. The Pharmacare program is available to all eligible Nova Scotia seniors who (1) are residents 65 years of age and older, (2) have opted to participate by payment of the required insurance premium and copayments and (3) are not insured by the Federal Government (i.e. military veterans, Royal Canadian Mounted Police, and Status Indians). Virtually all eligible residents of Nova Scotia, 65 years of age and older, were considered to be covered by this program until an insurance premium was introduced in April 1995. Some seniors (N = 3,876) who did not pay were dropped in 1995.[53] Approximately 95.8% of registered seniors (N = 103,306) had at least one Pharmacare drug claim in 1995/96. Data include drug claims for persons who were private and public residents of nursing homes but exclude drugs received while in hospital. The drug claims provide the following information:

encrypted unique patient identifier, Drug Identification Number (a DIN is assigned to a product using information on the manufacturer, active ingredient(s), strength of active ingredient, pharmaceutical dosage form, brand/trade name, and route of administration), date of fill, quantity and days supply and the amount paid to the dispensing pharmacy which includes professional fee and drug cost reimbursed in accordance with Pharmacare policies. In summary, these data may be considered representative of insured drug use by the Nova Scotia senior population during the study period 1989 to 1995.

Data for diagnosed medical conditions were provided by the Medical Services Insurance (MSI) Physician Services database and Nova Scotia's hospital separations abstracts. The hospital separations database contains ICD-9 codes for diagnostic data that are abstracted by trained health records technicians when persons are discharged from hospital. The MSI database contains claims for all universally insured physician services paid for by the government and provided free of charge to all eligible Nova Scotia residents. Most physicians were paid on fee for service during this study period. Claims are encrypted with unique patient identifiers and include information on the type and date of service, ICD-9 (first three digits) diagnostic codes for reported medical conditions, and the specialty of physician providing service. Medical conditions are documented on the claims by an ICD-9 code that is selected by the physician to indicate the primary reason for the patient visit. These data are representative of all insured medical services, for which physicians are paid, during the study period 1989/90 to 1995/96. Data for services that are not covered by MSI are excluded from the database. Medical conditions documented on the claim do not represent the complete health status of the patient. Systematic bias in coding practices and comorbidities may mask the coding of some diseases.

Measurement and Study Design

Subjects for this study were persons with diabetes who were beneficiaries of the Nova

Scotia Seniors' Pharmacare program between April 1, 1989 and March 31, 1996. Diabetic seniors were identified using a validated prevalent case definition for diabetes mellitus developed in ongoing and previous work by Leblanc and Kephart for use with MSI and Pharmacare administrative health data.[57] Drug Identification Numbers (see Appendix III) were compiled for all antidiabetic (see table 1) and antihypertensive drugs (see table 2) covered by the program. To be identified as a pharmacologically or non-pharmacologically treated diabetic, each senior required at least one physician service claim or hospital abstract code indicating diabetes mellitus (ICD-9 code = 250) in a year or at least one antidiabetic drug claim in a year. This measurement of prevalent cases of diabetes mellitus was previously validated by Kephart and Leblanc, using two diagnostic standards: (1) the 1995 Nova Scotia Health Survey data was used to identify non-cases and (2) the Diabetes Care Program of Nova Scotia was used to identify confirmed diabetics. The sensitivity of this definition was 74% and the specificity was 98% for the 1995 fiscal year.[18]

Drug claims were identified by antihypertensive drug type using the DIN and the Anatomical Therapeutic Chemical (ATC) Index.[58] Table 2 displays how drugs were aggregated to create therapeutic antihypertensive drug categories and subcategories. Drug categories were defined by shared chemical, therapeutic and pharmacological characteristics of drugs used in single-entity preparations. All drug preparations containing more than one antihypertensive drug were placed in a separate therapeutic category for fixed combination antihypertensive preparations.

Drug use was measured as the number of antihypertensive drug users per 1,000 diabetic seniors with at least one antihypertensive drug claim per fiscal year. Rate of drug utilization for each drug category was measured within the population of persons with diabetes and at least one Pharmacare claim for an antihypertensive drug in a fiscal year. Drug use rates were adjusted to the age (age groups were 65 – 69, 70 – 74, 75 – 79, 80 –

84 and 85+ years) and sex composition of the population of diabetic antihypertensive drug users in the 1992 fiscal year.

Results

Study Population

A total of 1,127,670 drug claims for cardiovascular drugs were identified by 423 Drug Identification Numbers (8.5% of the 4,993 Drug Identification Numbers appearing in Pharmacare claims during the 7 years) which represent 51 antihypertensive drugs (identified by 66 ATC Index chemical substance subgroups). Two fixed combination drugs (atenolol with diuretics and lisinopril with diuretics) and two single-entity antihypertensive drugs (chlorothiazide and torsemide) were not used by the diabetics in this study.

Table 3 describes the age and sex distribution of the total study population between April 1, 1989 and March 31, 1996. A total of 26,933 seniors met the criteria for diabetes at least once, at any time, during the seven year study period. Of these, 3,582 seniors (13.3%) did not have an antihypertensive drug claim. Of the remaining 23,351 seniors, 900 persons were excluded from further study due to failure to meet the criteria for diabetes in the same fiscal year as their antihypertensive drug claim. The final study population of 22,451 seniors was comprised of 57% females and 43% males. The final study population of diabetic antihypertensive drug users represented 10.8% of the 107,827 seniors reported to be registered or insured by Pharmacare in 1995. The prevalence of diagnosed diabetes in the insured Pharmacare population is underestimated due to the exclusion of seniors who met the diabetes criteria but did not have an antihypertensive drug claim in 1995, and by the estimated 74% sensitivity of the prevalent case definition for diabetes.

Table 4 provides the distribution of seniors with diabetes for the 1995 fiscal year by sex and age group. The age and sex distributions of diabetic seniors for each fiscal year are provided in Appendix IV. In 1995, the 11,696 diabetic seniors were comprised of 7,310 (63%) females and 4,387 (37%) males (note: one senior was indicated as both male and female). The proportion of all Pharmacare beneficiaries and diabetic seniors over 75 years of age, which indicates the relative aging of the population over time, is provided in Appendix VI and VI. The proportion of diabetic seniors over 75 years of age increased 2.6% (1989 - 46.5% to 1995 - 49.1%), while the proportion for all Pharmacare beneficiaries increased 4.5% (1989 - 43.2% to 1995 - 47.7%) in the same time period. The proportion of potentially frail elderly, 85 years of age and over, was 10.4% (N = 1,222; males 321, females 901) in 1995.

Table 5 provides for each fiscal year, the number of Pharmacare beneficiaries with at least one Pharmacare claim, the number and proportion of diabetics using antihypertensive drugs, the total drug expenditure for beneficiaries of the Nova Scotia Seniors' Pharmacare, the antihypertensive drug expenditure for diabetic seniors, and the mean and standard deviation of the antihypertensive drug expenditure per diabetic senior. Reported total drug expenditures are direct drug costs (including drug cost after adjustments in accordance with reimbursement policies and professional fees excluding copayments paid by seniors) from the perspective of the Nova Scotia Seniors' Pharmacare program and were unadjusted for inflation. A slight increase was observed in the percent of seniors who met the criteria for diabetes and received at least one antihypertensive drug in a fiscal year over the seven year period. Antihypertensive drug expenditures in diabetics increased 32.9% between 1989 (C$3.6 M) and 1995 (C$4.7 M). These expenditures represented 5.0% in 1989 and 6.7% in 1995 of the total annual expenditures for the Nova Scotia Seniors' Pharmacare Program. The mean annual expenditure per diabetic senior paid by Pharmacare, excluding copayments paid by seniors, increased $49.32 (13.8%)

during the study period. The increase in cost of antihypertensive drug expenditures is underestimated by the exclusion of copayments that were introduced on June 1, 1990 and increased during the study period (refer to Appendix V).

Antihypertensive Drug Utilization

Figure 1 and table 6 present data on the utilization of antihypertensive drugs. Rates were directly standardized to the age-sex composition of the 1992 study population, and expressed as the number of users per 1,000 diabetic seniors with at least one antihypertensive drug claim per fiscal year. These rates represent the share of all antihypertensive drug use within all diabetic users of antihypertensive drugs and may be expressed as the proportion of users, or as the rate of use per 1,000 diabetic users. Between 1989 and 1995, major increases in share were observed for angiotensin converting enzyme inhibitors and calcium channel blockers. The largest relative increase, 83.2%, was observed for angiotensin converting enzyme inhibitors (from 21.6% to 39.6% of all diabetics treated with antihypertensive drugs). This was the second most commonly prescribed antihypertensive drug type in 1995. Calcium channel blockers were the most frequently prescribed antihypertensive drug type in 1995, increasing their share by 41.9% (from 28.9% to 41.0% of all diabetics treated with antihypertensive drugs). Only low to moderate increases in the use of high ceiling diuretics and beta-blockers were observed. The share of high ceiling diuretics increased 1.2% (from 26.4% to 26.7% of all diabetics treated with antihypertensive drugs). The share for beta-blockers decreased slightly between 1989 and 1992, and increased overall by 6.0% (from 31.8% to 33.7% of all diabetics treated with antihypertensive drugs). Fixed combination antihypertensive preparations (i.e. antihypertensive combinations), that contain more than one antihypertensive drug, were the most commonly used drug type in 1989, however, their share of use substantially decreased by 47.9% (from 38.8% to 20.2% of all diabetics treated with antihypertensive drugs). The share for two other categories also declined among diabetics: antiadrenergics decreased 43.8% (from 13.5% to 7.6% of all diabetics

treated with antihypertensive drugs) and potassium sparing diuretics decreased 28.1% (from 2.6% to 1.9% of all diabetics treated with antihypertensive drugs). Despite a slight decline between 1989 and 1992, the share of low ceiling diuretics returned to the same level in 1995 (16.7% of all diabetics treated with antihypertensive drugs in 1989 and 1995). The total share of drug use in 1995 was 187.5%, indicating that on average diabetics used 1.9 drugs, therefore many patients were using two or more drugs from different antihypertensive drug categories.

Discussion

In order to conduct this study of antihypertensive drug use in diabetic seniors, it is important that the diabetic population be accurately identified. Drug claims in Nova Scotia Seniors' Pharmacare do not contain information on diagnoses or the reason for drug use. Therefore, data linkage was required to obtain diagnostic information from physician claims data that may correspond with drug claims. Based upon the sensitivity (74%) and specificity (98%) of the prevalent case definition for diabetes (previously determined for the 1995 fiscal year)[57], and assuming a 10.8% self-reported point prevalence of diabetes in seniors[18], the positive predictive value of this definition was 85% (i.e. 15% of seniors identified by the diabetes definition were false positives and were not diabetic) and the negative predictive value was 97% (i.e. 3% of diabetic seniors who fail to meet the criteria were false negatives and were diabetic). Therefore, approximately 1,754 non-diabetic persons (15% of 11,696) in 1995 were potentially misclassified as diabetic in this study. Leblanc and Kephart report this definition is more likely to underestimate, rather than overestimate, the prevalence of diabetes.[57]

The proportion of the population identified as diabetic and treated with an antihypertensive was moderately higher than expected, and increased steadily during the

study period. The proportion of seniors with diabetes and antihypertensive drug claims increased from 9.5% in 1989 to 11.3% in 1995; however, the prevalence in the Pharmacare population would be higher with the inclusion of diabetics without antihypertensive drug claims. The 1995 prevalence of diabetes in this study is thus greater than that reported in the Nova Scotia Health Survey (10.8%). One reason may be the inclusion, in this study, of elderly persons living in nursing homes, who were excluded from the Nova Scotia Health Survey.

In this study, the majority of seniors with diabetes had at least one antihypertensive drug in a fiscal year between 1989 and 1995. Of all seniors who met the criteria for diabetes in 1995 (data not shown, N = 17,447), 67% (N = 11,696) had at least one antihypertensive drug claim. This is consistent with the high prevalence of cardiovascular disease in diabetics[7,12] and the high prevalence of hypertension (≥140 mmHg systolic or ≥90 mmHg diastolic blood pressure with or without drug treatment), reported to affect 59% of the Canadian population 65 years of age and over.[17] The reason for lack of antihypertensive drug use in the remaining 33% (N = 5,751) of diabetic seniors is unknown, but potentially may be due to the absence of hypertension, or the lack of awareness and treatment of hypertension that has been reported in the general Canadian senior population[17] or noncompliance with prescribed treatment. Hypertension is the most common indication for use of antihypertensive drugs; however, these drugs are also used in the treatment of other conditions such as ischemic heart disease and congestive heart failure. The reason for drug use was not known in this study. The prevalence of other indications for antihypertensive drugs such as angina and congestive heart failure is also greater in diabetics compared to non-diabetic seniors.[7] Thus, the proportion of patients who received appropriate treatment could not be determined due to the lack of sufficient individual level data regarding presence of comorbid medical conditions of each patient. Comparison of the population level trends in drug use with treatment standards was further limited by lack of data on the combination of drug treatments (i.e. the concomitant

use of different drug types) and key clinical parameters (e.g. proteinuria, blood pressure).

The use of combination drug preparations was only measured in the antihypertensive drug category for fixed combinations. The extent to which use in all other drug categories is underestimated is unknown and depends on the number of persons who used fixed combination drugs but did not have a claim for other single-entity preparations of the drugs contained in the combination during the same fiscal year. The underestimation of drug use in the non-fixed combination categories resulting from the exclusion of drugs contained in fixed combinations is most likely minimal, with the exception of diuretics. In 1995, (N = 2000) used products that were comprised only of diuretics.

Many of the trends in antihypertensive drug use observed in this study are similar to those previously observed in the general senior population in Nova Scotia[1,4] and those of other North American Populations.[5,59-62] A Nova Scotia study examining trends in self-reported drug treatment of hypertension for participants (aged 25 to 74 years) in the population-based 1985 and 1995 Halifax County MONICA Surveys, found calcium channel blockers were the most commonly used drug treatment in 1995.[4] Similarly large relative increases in the use of calcium channel blockers and angiotensin converting enzyme inhibitors and decline in the use of fixed combination products were noted.[4] Another study of antihypertensive drug use in the same population of Nova Scotia Seniors' Pharmacare beneficiaries that was used in this study, also found similar increasing and decreasing trends in drug use but there were slight differences in the ordinal ranking of drug categories.[1] Most notably, angiotensin converting enzyme inhibitors were the second most commonly used antihypertensive drugs in diabetics compared to beta-blockers in the general senior population. Table 6 presents the age-sex standardized rates of antihypertensive drug use for diabetics and Pharmacare beneficiaries of the Nova Scotia Seniors' Pharmacare Program in 1995. These rates may be compared

in relative terms; however, the use of different standard populations prevents direct comparison of magnitude.[1]

The steady increase in prevalence of diabetics treated with antihypertensive drugs observed in this study may be due to several factors. Because the prevalence of diabetes increases with age, the rise in prevalence may in part be accounted for by increases in the proportion of seniors over the age of 75 (see Appendix VI). An increase in the prevalence of other type II diabetes risk factors, such as obesity[18] reported in Nova Scotia seniors may also explain the increasing prevalence, but the extent to which increased diagnosis, improved diagnostic coding or drug treatment of diabetes may have contributed to the prevalence of diabetes observed in this study is unknown. Further examination of the prevalence and incidence of diabetes in the Nova Scotia senior population is needed.

Other factors that may have contributed to the increased use of antihypertensive drugs include the availability of new drugs and dosage forms, approval of new indications, publications in the professional and lay literature, practice guidelines, and drug product marketing by manufacturers. The trends observed in this study reflect changes to the recommendations for treatment of hypertension made in Canada between 1989 and 1995[15,45,46] and the United States.[9,63] Further study using techniques including time series analysis is required to specifically examine the association between these factors and the fluctuation of trends over time. Other issues that may be important factors in the use of each antihypertensive drug category are considered below.

Calcium channel blockers

In this study, calcium channel blockers were the most common antihypertensive drugs used by diabetics in 1995, and their relative share of all antihypertensive drug use

increased by 41.9% (1989-28.9%; 1995-41.0%). Calcium channel blockers are consistently reported as the most commonly used antihypertensive drugs in Nova Scotia[1-3] and elsewhere in Canada and the United States.[59,64] In part this may reflect their use in coronary heart disease. Many preparations of calcium channel blockers are marketed in

Canada and have other indications including angina, selected cardiac arrhythmias, Raynaud's Phenomenon, prevention of preterm labour, hypertrophic cardiomyopathy, and manic manifestations of bipolar disorder.[65,66] The dihydropyridine calcium antagonists (see selective vascular agents in table 2), are also recommended for treatment of isolated systolic hypertension.[9] Calcium channel blockers have been reported to reduce albuminuria in diabetics, but currently there is lack of evidence regarding their ability to prevent nephropathy.[13] In 1995, the risk/benefit ratio of some calcium channel blockers was the subject of much controversy in both the professional and lay press.[67-69] The growth in calcium channel blocker usage appears to have slowed. Trends in use since 1995 need to be examined to determine the effect of this controversy in the diabetic senior population.

Angiotensin Converting Enzyme Inhibitors

In this study, the share of all antihypertensive drug use for angiotensin converting enzyme inhibitors increased by 83.2% (1989-21.6%; 1995-39.6%) between 1989 and 1995. Other studies have also reported large increases in the use of angiotensin converting enzyme inhibitors.[59,70] The use of angiotensin converting enzyme inhibitors may also be increasing in congestive heart failure, or post-myocardial infarction. Other indications include renovascular hypertension, Raynaud's Phenomenon, and idiopathic edema.[9,65,66,71] In Canada[6,45] and the United States,[9,13] angiotensin converting enzyme inhibitors are recommended for treatment and prevention of nephropathy in normotensive type I diabetics with microalbuminuria, but there is a lack of consensus regarding their similar use in normotensive type II diabetics. Their use in all diabetics with signs of progressive

nephropathy is recommended.[6,9,12,13] There are several major contraindications (the clinical literature should be consulted for a more extensive list) to the use of angiotensin converting enzyme inhibitors including bilateral renal artery stenosis, hyperkalemia[9,12] and advanced renal disease in the elderly.[13] The potentially appropriate level of drug use in this study cannot be determined due to lack of data, including potential contraindications and the prevalence of early nephropathy. A retrospective study of 183 persons with hypertension, aged 25 to 93 years, treated in a Quebec Family Medicine teaching clinic between 1993 and 1995, reported that only 12 of 37 hypertensive diabetics were treated with angiotensin converting enzyme inhibitors.[51] Further study is required to determine how angiotensin converting enzyme inhibitors are used in diabetic seniors. Examination of angiotensin converting enzyme inhibitor use in the presence and absence of other comorbid conditions and in the presence of proteinuria in type I and type II diabetic seniors is required.

Beta-blockers

Beta-blocker use increased 6.0% (1989-31.8%; 1995-33.7%) in this study. Beta-blockers improve survival after myocardial infarction but must be used cautiously in patients with heart failure, peripheral vascular disease and asthma.[42] In diabetics, non-cardioselective beta-blockers may worsen hyperglycemia and may mask symptoms of hypoglycemia in type I diabetics[12] but the recent Canadian Diabetes Association guidelines recommend the use of low-dose diuretics and beta-blockers in elderly diabetics to prevent cardiovascular disease.[6] Prevention of nephropathy by beta-blockers has been reported but there is insufficient evidence to determine if they are as effective as angiotensin converting enzyme inhibitors.[13] Beta-blocker use in diabetics must be further examined by type of cardioselectivity and the presence of other comorbid conditions.

Antiadrenergics

The antiadrenergic share of drug use was relatively low throughout the study period and

decreased by 43.8% (1989-13.5%; 1995-7.6%). These drugs are not recommended for first- or second-line treatment of hypertension, except for alpha-adrenergic blockers which are recommended for first-line use in diabetics, but not in seniors.[15,45] Antiadrenergic drugs may cause serious side effects in seniors (the clinical literature should be consulted for further information), particularly reserpine, methyldopa and clonidine preparations which can include cognitive impairment, sedation, depression and orthostatic hypotension. Orthostatic hypotension is also caused by alpha-blockers.[15] Drugs causing orthostatic hypotension should be particularly avoided in diabetics with autonomic neuropathy.[12] Alpha-adrenergic blockers are also indicated for benign prostatic hyperplasia that is common in male seniors.[65,66,72] The use of alpha-blockers was not examined separately from other antiadrenergics. Further study is needed to determine if the continued use of these drugs is a cause for concern in diabetic seniors.

Diuretics

Diuretic use was examined for single-entity preparations of low-ceiling, potassium-sparing, and high-ceiling diuretics (also called loop diuretics). Diuretic use is under-reported to the extent that users of fixed combination drugs, which most commonly contain thiazide or potassium sparing diuretics, did not have a claim for single-entity diuretic preparations in a fiscal year. Examples of other indications for diuretics include congestive heart failure and other causes of edema.[65,66] A recent Canadian study of persons $\geq$ 18 years of age, in a family practice setting, found diuretics to be the most frequent category of drugs prescribed for treatment of hypertension.[51] Unfortunately, the total share of drug use due to diuretics in this study was not examined.

In this study, the share of single-entity low ceiling diuretic preparations remained low and changed very little (1989-16.7%; 1995-16.7%) during the study period. In Canada, low dose diuretics are the preferred choice of treatment in elderly persons.[15] Lower doses of diuretics (e.g. equivalent to hydrochlorothiazide 25 mg per day or less)[15,42] were

recommended in Canada in 1993 which coincides with a slight increase in use from 1992 until 1995. At low doses, thiazides are less likely to cause hyperkalemia, alter insulin sensitivity or lipid profiles.[8] Thiazides may also be effective in persons with moderate renal function.[12] The United States and the World Health Organization currently recommend low dose diuretics for first-line treatment to reduce cardiovascular events in both diabetics and non-diabetics with hypertension[8] while, as previously mentioned, the Canadian Diabetes Association recommends beta-blockers with low-dose diuretics be used in the elderly.[6]

The use of high ceiling diuretics increased slightly by 1.2% in this study (1989-26.4%; 1995-26.7%). High-ceiling diuretics are used in diabetics when kidney function is severely impaired and their use in congestive heart failure or renal disease may also be increasing.[9,12,45] Recent projections by Schaubel et al. report the number of Canadians receiving renal replacement therapy (e.g. kidney transplant, peritoneal dialysis, hemodialysis), is expected to increase 85% between 1996 and the end of 2005, to affect almost 33.000 persons.[37] In Nova Scotia, approximately 20% of persons initiated on dialysis per year have diabetes and diabetic nephropathy.[12] Further study is needed to determine the reason for increased use of high ceiling diuretics in this population.

A 28.1% relative decrease in the use of potassium sparing diuretics (1989–2.6%; 1995–1.9%) was observed in this study. Potassium sparing diuretics are recommended for addition to treatment when potassium levels decline. The decrease in use may be due to the use of lower daily doses for diuretics resulting in less potassium depletion.[15] The use of potassium sparing diuretics is also under-estimated due to the exclusion of persons using these drugs in fixed combinations.

The 47.9% relative decline in fixed combination preparations used in this study (1989–38.8%; 1995–20.2%), is indicative of the lower daily dose recommended for diuretics in

the 1993 guidelines of the Canadian Hypertension Society.[15] Diuretic plus potassium-sparing diuretics were the most common type of fixed combination drugs used in this study (N = 3,277 diabetic users in 1989; N = 2,000 in 1995). Fixed combination drugs are a convenient dosage formulation and sometimes provide a less expensive treatment alternative; however, the daily diuretic dose can be higher than is recommended for seniors. Manufacturers now provide fixed combination products with lower daily doses of diuretics. Further study is required to determine and compare the daily doses used by diabetic seniors with the dosage recommendations for each drug component.

Angiotensin II AT_1 Receptor Blockers

Trends in the use of angiotensin II AT_1 receptor blockers could not be examined in this study as these drug preparations were only used in the last year of study. Many new drugs have been marketed in Canada since 1995. In the United States, angiotensin II AT_1 receptor blockers are suggested for use as an alternative to angiotensin converting enzyme inhibitors when such therapy is undesirable.[9] Future analyses of the trends in the use of this new drug class are needed as new evidence and new indications for use emerge.

The use of calcium channel blockers and angiotensin converting enzyme inhibitors, which are first-line antihypertensive drugs for the diabetic population, increased in this study but further clinical data are required to determine if the level of use is appropriate for this diabetic population. The increasing prevalence of diabetes and patients need for antihypertensive drug treatment, particularly with angiotensin converting enzyme inhibitors, have the potential to further increase antihypertensive drug expenditures in a patient population that represented 7.7% of total Pharmacare drug expenditures in 1995.

Expenditures

Expenditures and the total number of Pharmacare beneficiaries and diabetics fluctuated during the study period. Total Pharmacare expenditures, unadjusted for inflation, were

lower in 1995 than 1989, while total and average expenditures for antihypertensive drugs in diabetics increased 33% (C$1.2 M) and 14% (C$49.32), respectively. In this study, the total antihypertensive drug expenditure for diabetics represented 23% (C$4.7 M) of total annual antihypertensive drug expenditures (C$20.4 M in 1995) reported for Nova Scotia Seniors' Pharmacare by Sketris et al.[1] From the perspective of Pharmacare, the total cost of drug expenditures is comprised of the following: the number of beneficiaries (i.e. drug users), the total use of covered drugs, the price paid for drugs and fees, and the proportion of expenditures shared with seniors.[73] The introduction of cost-sharing policies in 1990, 1993 and 1995 may be responsible in part for the fluctuation in expenditures and beneficiaries observed in this study. (Refer to Appendix V for a chronological overview of copayment, premium and insurance policies.) The Pharmacare program provided all drugs to all seniors free of charge from 1974 to 1990 when a fixed copayment fee was introduced.[74-76] Expenditures decreased between 1989 and 1990 but the number of beneficiaries appears unaffected. On January 1, 1993, the maximum annual copayment increased from C$150 to C$400 for seniors who did not receive the Guaranteed Income Supplement. This policy would have affected a substantial percentage of this study population. In 1995, 44% of Pharmacare beneficiaries did not receive the Guaranteed Income Supplement; although, given the association between income and health, it is probable that more diabetics would receive the Guaranteed Income Supplement.[7] Finally, the program became a voluntary insurance plan with a mandatory annual insurance premium on April 1, 1995.[53,76] Previous literature has demonstrated that drug utilization is reduced when direct costs to patients are increased.[77,78] Despite increased out-of-pocket costs, seniors are protected from catastrophic drug costs and high levels of use which exceed the maximum annual premium and copayment limits. The use of antihypertensive drugs would be affected to the extent that they are perceived to cause a marginal increase in direct cost to diabetics. Quebec researchers, in a press release, reported that increased direct costs of drug treatment resulted in increased hospitalizations, mortality, emergency room and physician utilization while decreasing

the use of both essential and nonessential drugs particularly in the elderly and welfare recipients.[79] Strategies to contain drug expenditures such as drug pricing policies (e.g. Maximum Allowable Cost) and restrictions for use criterion were implemented during the study period.[80,81] The continued increase of drug expenditures in this study is likely due to more frequent use of new and more expensive drugs by more diabetics, as was found in a study of Pharmacare drug use in the general senior population in British Columbia.[82] Further study is needed to examine the factors related to the changes in drug use expenditures.

The findings of this study may prove to be generalizable to diabetic seniors in other jurisdictions with similar drug insurance benefits for several reasons. Firstly, the data for this study was derived from the Nova Scotia Seniors' Pharmacare which provided essentially complete and automatic coverage for virtually all persons aged 65 and over, including residents of nursing homes, between and 1989 and 1994, and for more than 90% of the total Nova Scotia senior population in 1995.[80,83] The large population base and stability of the senior population over time is a considerable strength of this study. Secondly, Nova Scotia Seniors' Pharmacare program covered all prescription antihypertensive and antidiabetic drugs (except acarbose, see table 1) available in Canada during the study period. Thirdly, population-based drug use is the result of the combined effects of physician prescribing, patient drug use patterns, and government health care policy; this reflects "real world" drug use as opposed to controlled studies which are less, if at all, generalizable or less likely to reflect drug use in a non-controlled environment.[84]

In addition to the strengths of this study, there are several important limitations that must be discussed. This study only examined prescriptions filled by seniors and paid for by Nova Scotia Seniors' Pharmacare. Thus, this study examined trends in use, not prescribing per se. The percentage of filled prescriptions may depend on a number of factors including patient characteristics (i.e. medical status, socioeconomic status),

perceived benefit of the drug (i.e. health beliefs), ease of filling the prescription, and direct cost to the patient.[82] Tamblyn et al. found 83% of prescriptions written for 311 elderly patients appeared in the Quebec administrative claims file within one month of the prescription date.[49] The extent to which drugs are paid out-of-pocket is also unknown.

The validity of drug data in the Pharmacare program has not been determined by medical or pharmacy chart abstraction; however, the database is based on provider claims that are subject to audit and assessment. Subsequently, it is expected to be subject to minimal over or under-reporting of prescription drug utilization.[82,85] Moreover, information on the drug prescribed, patient and cost tends to be accurate since it is required for payment[82,85,86] and drug claims are not subject to recall or interviewer bias.[87] Two previous studies of drug utilization in Nova Scotia have been consistent with findings in other studies; these may indicate the accuracy of the database.[88,89]

Many issues important to the interpretation of trends in drug use were beyond the scope of this study but need to be examined in future. The intensity of drug exposure in terms of dosage, persistence with treatment and drug acquisition require individual analyses and were not examined in this study. First prescriptions and refills are not differentiated which would facilitate examination of initial drug therapy and switching patterns. Data for drugs found in both single entity and fixed combination preparations were not pooled to examine overall rate of use. This will be required in future studies that examine dosages or levels of adherence for specific drugs. Treatment regimens using more than one type of cardiovascular drug were not examined. Current literature suggests there may be a role for the use of angiotensin converting enzyme inhibitors and calcium channel blockers in combination in diabetic patients. The use of drug combinations must be investigated in terms of cost and efficacy at the population level.

Consideration should also be given to the relatively large proportion of potentially frail

elderly diabetics. The elderly experience changes in metabolism and drug distribution that increase their risk of adverse drug reactions. Antihypertensive drugs which cause depression, cognitive impairment, sedation or orthostatic hypotension are not recommended for the elderly.[15] Examples of antihypertensive drugs that should be avoided in the elderly include reserpine, guanethidine, methyldopa and clonidine, however, other antihypertensives may also cause potentially serious adverse effects in the elderly.[49,90,91] The elderly must also be carefully monitored to avoid potential adverse effects resulting from severe hypotension. Further study of antihypertensive drug treatment and health outcomes in the frail elderly population is required.

In summary, the prescription claims data in this study are expected to be essentially complete for the diabetic Nova Scotia senior population, which does not typically have alternative prescription drug coverage, and for seniors whose annual prescription costs will exceed the total for copayment and premiums. While the generalizability of these findings is unknown, the trends in drug use may be similar to other diabetic populations in other jurisdictions with similar drug insurance. However, the results of this study may not be generalized to diabetic populations who were excluded from Nova Scotia Seniors' Pharmacare, such as First Nations and veterans. Generalizability to other jurisdictions may be limited by differences in treatment and compliance.

Relevance, Implications and Recommendations for Future Research

The examination of antihypertensive drug use in a defined and clinically relevant subpopulation, such as diabetics, has provided very useful information regarding the potential appropriateness of trends in drug use. In the context of the diabetic population, drug use could be examined relative to specific recommendations for drug selection and treatment. Unfortunately, the lack of key clinical variables continues to limit the

evaluation of drug use for appropriateness at the population level. Clinical data are required to examine the characteristics, effectiveness and cost of drug treatment to determine the potential level of appropriateness for antihypertensive drug treatment at the population level.

The goals for continuing research in the diabetic population are vast and may include examining the role of comorbidity in the use of antihypertensive drugs in diabetic seniors and the appropriateness of treatment based on the clinical status of individuals in this population who are at risk of kidney and further cardiovascular disease. In the absence of specific information regarding the reason for drug treatment, other administrative case definitions may be developed for other disease and risk factors relevant to the appropriateness of treatment with antihypertensive drugs. For example, the use of antihypertensive drugs in diabetics and non-diabetics with and without ischemic heart disease and congestive heart failure can provide more useful information regarding the level and pattern of antihypertensive drug treatment for drugs that are indicated for the treatment of these comorbid conditions in addition to hypertension. The Canadian Hypertension Society has identified the need to measure and compare the management of hypertensive diabetics at the regional level across Canada.[45] The population-based measurement of antihypertensive drug use in Nova Scotia's diabetic seniors using a validated method to identify diabetics with administrative data that is also available in other provinces has partially addressed this mandate.

The methodology of this study may be used in other Canadian jurisdictions to obtain comparable data that may be used to examine drug-treated disease management in diabetics. Many Canadian jurisdictions have already made or plan to make modifications to their provincial/territorial Pharmacare programs that will facilitate drug use evaluation, disease surveillance (i.e. prevalence and incidence), pharmacoeconomic evaluation and humanistic outcomes research.[83] The National Diabetes Surveillance System, which is

being developed by Laboratory Centre for Disease Control of Health Canada, will also use administrative data and health record linkages to monitor, among other things, the quality of diabetes care, economic costs of diabetes, diabetic complications, and the diabetes management practices of health professionals and patients.[7] With access to appropriate information, researchers and clinicians will be better able to guide policy makers to develop healthy public policies, target the resources and educational strategies required to effect optimal drug-related health outcomes and provide cost-effective health services. Overall, these measures will improve the accountability of the health care system by providing cost-effective indicators for the quality of care provided in this province.

This study provides baseline data that is important for modeling the economic impact and potential patient outcomes of new and anticipated trends in antihypertensive drug use. The diabetic population stands to receive significant health benefits from trends in drug use that compare favourably with continually updated treatment standards and new evidence of long-term benefits. While this study demonstrates the benefits of examining drug use with respect to a disease specific population, further data on patient characteristics are required to examine appropriateness of drug use and to model new trends in antihypertensive drug use at the population level. Specifically, data on renal function at the individual level obtained by encrypted linkage to administrative laboratory data (i.e. proteinuria values) and linkage to the Canadian Organ Replacement Register (i.e. kidney transplant status), would provide population data on kidney function to assist with modeling both patient and economic outcomes based on various scenarios for drug treatment. Such models would further target the health care resources required to optimize treatment for diabetics while striving to contain overall costs to the provincial health care system. Examination of the potential patient and economic outcomes associated with increased drug treatment expenditures for the prevention and treatment of renal nephropathy in diabetics that may result in significant avoided expenditures in other

sectors of the health care system (i.e. renal replacement therapy) is required.

Inappropriate drug utilization can cause adverse drug reactions, hospitalizations and increase health care costs.[92] Nova Scotia researchers are developing population-based research methodologies appropriate for use with administrative data which can provide cost-effective, relevant and timely information on the potential appropriateness of trends in drug use. This study continues to build on the population-based drug use research previously conducted in this province. Nova Scotia must further develop the existing capacity for population-health research, particularly in the area of optimal drug utilization, to develop cost-effective research tools and validate research methods and findings. Specifically, the province must expand the ability to link existing encrypted administrative data resources with disease specific databases, and laboratory data to access key clinical parameters. This is required to effectively examine potential under use and the potential appropriateness of drug use trends in the Nova Scotia population.

Finally, other administrative case definitions need to be developed for other diseases and risk factors, and used to examine the population-based management of medical conditions where drug treatments may offer significant health and economic benefits. One example may be the examination of angiotensin converting enzyme inhibitor and beta-blocker treatment to improve survival of patients after myocardial infarction.[93] The development of research methods using data that is readily available in other provinces can provide valuable information on the drug related health status of the Canadian population and specific population subgroups.

While population-based drug use research has the potential to improve the health status of Canadians by identifying potentially inappropriate trends in treatment, the use of linked administrative health data, without the expressed consent of clinicians or patients, to guide policy and target interventions for individual physicians and patients raises several

concerns regarding their right to privacy and confidentiality. Clinicians are concerned that erroneous conclusions result from data that are insufficient to address complex health care issues, while many patients are concerned that their health and socioeconomic information will be made public.[94] Care must be taken to ensure that the data are used ethically and appropriately to guide targeted examination of clinical issues, educate clinicians and patients regarding drug use, and to develop responsible healthy public policy.

Conclusions

The increased use of calcium channel blockers and angiotensin converting enzyme inhibitors in diabetic seniors between 1989 and 1995 is compatible with Canadian, guidelines for treatment of comorbid hypertension and diabetes; however, data in this study were insufficient to determine the appropriateness of drug-use trends in this population. The ability to make further linkages between administrative data and key clinical parameters (i.e., laboratory values, reason for drug use, comorbid medical conditions) is required to make relevant comparisons with treatment standards for diabetes and hypertension. Only 40% of antihypertensive treated diabetics were treated with angiotensin converting enzyme inhibitors. The increased use of angiotensin converting enzyme inhibitors and other antihypertensive drugs may be anticipated as further studies regarding the long-term benefits of treatment for both type I and type II diabetics who are at risk of serious renal disease are published. Further research is required to model anticipated drug use trends, the complex economic implications of optimal antihypertensive drug treatment in the diabetic senior population, and varied health outcomes. This study has shown how examination of a disease specific subpopulation is an improvement in the use of population-based administrative health care data as a tool to examine drug use in a way that is directly relevant to patients, health care providers, educators, researchers, industry and health care policy makers.

Although the study analyzed data from the Nova Scotia Department of Health, the conclusions are solely those of the author.

Appendix I: Tables

Table 1. Classification of Antidiabetic[1] Drugs Used in Nova Scotia Seniors' Pharmacare between April 1, 1989 and March 31, 1996.[2]

Category	Subcategory	Drug	Anatomical Therapeutic Chemical Index (ATC)[3]
Insulin		Fast Acting Insulin	A10AA01
		Intermediate Acting Insulin	A10AA02
		Long Acting Insulin	A10AA03
		Premixed, Intermediate and Fast Acting Insulin	A10AA04
Oral Antidiabetic Agents	Biguanides	Metformin	A10BA01
	Sulfonamides	Chlorpropamide	A10BB01
		Tolbutamide	A10BB02
		Glyburide	A10BB03
		Acetohexamide	A10BB04
		Gliclazide	A10BB05

1 Human and animal insulins were classified with the same ATC Index according to onset of activity.

2 The following drugs were not available in Canada during the study period: acarbose (Prandase®) and insulin lispro (Humalog ™).

3 World Health Organization Collaborating Centre for Drug Statistics Methodology. Anatomical Therapeutic Chemical (ATC) Index with DDD's 1997. Oslo: World Health Organization, 1997.

Table 2. Classification of Antihypertensive[1] Drugs Used in Nova Scotia Seniors' Pharmacare between April 1, 1989 and March 31, 1996.[2]

Category	Subcategory	Drug	ATC[3]
Antiadrenergics	Peripheral Adrenergic Antagonists	Guanethidine	C02CC02
		Debrisoquine	C02CC04
	Central Sympatholytic	Reserpine [4]	C02AA02
		Methyldopa	C02AB01
		Clonidine	C02AC01
	Alpha-Adrenergic Blockers	Prazosin	C02CA01
		Terazosin	C02CA05
		Doxazosin	C02CA04
	Direct Vasodilators	Hydralazine	C02DB02
		Minoxidil	C02DC01
Low Ceiling Diuretics	Low Ceiling Diuretics: Thiazides	Bendroflumethiazide	C03AA01
		Bendroflumethiazide + Potassium[5]	C03AB01
		Hydrochlorothiazide	C03AA03
		Methyclothiazide	C03AA08
		Chlorothiazide[5]	C03AA04
	Low Ceiling Diuretics: Other	Quinethazone	C03BA02
		Chlorthalidone	C03BA04
		Metolazone	C03BA08
		Indapamide	C03BA11
High Ceiling Diuretics		Furosemide	C03CA01
		Bumetanide	C03CA02
		Torsemide[5]	C03CA04
		Ethacrynic acid	C03CC01
Potassium Sparing Diuretics		Spironolactone	C03DA01
		Amiloride	C03DB01
		Triamterene	C03DB02

Table 2 continued on next page...

1 Drugs in the therapeutic groups C02, C03, C07, C08 and C09 of the ATC Index may be used for the treatment of hypertension, however, the indication for drug treatment is unknown in this study.

2 The following drugs were not available in Canada during the study period: Angiotensin II AT_1 Receptor Blockers: candesartan (Atacand®), irbesartan (Avapro™), valsartan (Diovan ®), Angiotensin Converting Enzyme Inhibitors: trandolapril (Mavik ™); Fixed Combinations: losartan with hydrochlorothiazide (Hyzaar®), quinapril with hydrochlorothiazide (Accuretic™), trandolapril with verapamil (Tarka®).

3 Modified from World Health Organization Collaborating Centre for Drug Statistics Methodology. Anatomical Therapeutic Chemical (ATC) Index with DDD's 1997. Oslo: World Health Organization, 1997.

4 Reserpine is also a centrally acting agent.

5 These drugs were covered by Pharmacare but were not used by diabetic persons in this study.

Category	Subcategory	Drug	ATC
Beta-Blockers (BBs)	BBs: Non-selective	Oxprenolol [6]	C07AA02
		Propranolol	C07AA05
		Timolol	C07AA06
		Sotalol	C07AA07
		Nadolol	C07AA12
	BBs: Selective	Metoprolol	C07AB02
		Atenolol	C07AB03
		Acebutolol	C07AB04
	BBs: Intrinsic Sympathomimetic Activity[6]	Pindolol	C07AA03
	Alpha-Beta Blockers	Labetolol	C07AG01
Calcium Channel Blockers (CCBs)	CCBs: Selective, Vascular	Amlodipine	C08CA01
		Felodipine	C08CA02
		Nicardipine	C08CA04
		Nifedipine	C08CA05
	CCBs: Selective, Cardiac	Verapamil	C08DA01
		Diltiazem	C08DB01
Angiotensin Converting Enzyme Inhibitors (ACEIs)		Captopril	C09AA01
		Enalapril	C09AA02
		Lisinopril	C09AA03
		Fosinopril	C09AA05
		Quinapril	C09AA06
		Cilazipril	C09AA07
		Benazepril	C09AA08
		Ramipril	C09AA09
		Perindopril	C09AA10
Angiotensin II AT_1 Blockers	Angiotensin II AT_1	Losartan	C09CA01
Antihypertensive Fixed Combinations	Antiadrenergic+diuretics	Reserpine+diuretic	C02LA01
		Reserpine+other combinations	C02LA51
		Deserpidine+diuretic	C02LA03
		Methyldopa+diuretic	C02LB01
		Clonidine+diuretic	C02LC01
		Guanethidine+diuretic	C02LF01
	Diuretic+diuretic	Hydrochlorothiazide+ potassium-sparing diuretic	C03EA01
	BBs+diuretic	Propranolol+thiazide	C07BA05
		Timolol+thiazide	C07BA06
		Nadolol+thiazide	C07BA12
		Pindolol+thiazide	C07CA03
		Atenolol+chlorthalidone[5]	C07CB03
	ACEIs+diuretic	Enalapril+diuretic	C09BA01
		Lisinopril+diuretic[5]	C09BA02

6 Oxprenolol also has intrinsic sympathomimetic activity but was not included in the subcategory.

Table 3. Age and Sex Distribution of Seniors with Diabetes[1] and ≥ 1 Antihypertensive Drug Claims, Nova Scotia Seniors' Pharmacare, April 1, 1989 to March 31, 1996.[2,3]

Age Group (years)	Males		Females		Total Persons	
	N	Study Population (%)	N	Study Population (%)	N	Study Population (%)[4]
65 - 69	3,001	13.4	3,319	14.8	6,320	28.2
70 - 74	2,510	11.2	3,007	13.4	5,517	24.6
75 - 79	1,981	8.8	2,830	12.6	4,811	21.4
80 - 84	1,353	6.0	2,035	9.1	3,388	15.1
85+	724	3.2	1,691	7.5	2,415	10.8
Total	9,569	42.6	12,882	57.4	22,451	100.0

1 Seniors are identified by an administrative definition for pharmacologically or nonpharmacologically treated diabetes (i.e. at least one ICD-9 250 physician or hospital claim or at least one antidiabetic drug claim in the fiscal year) and have at least one claim for an antihypertensive drug in the specified fiscal year.
2 The selected antihypertensive drugs include the therapeutic groups C02, C03, C07, C08, and C09 of the 1997 World Health Organization Anatomical Therapeutic Chemical Index and are commonly used for the treatment of hypertension. The reason for treatment with antihypertensive drugs was unknown.
3 Total study population was 22,451. Persons were counted once between 1989 and 1995.
4 Sum is greater than 100% due to rounding error.

Table 4. Age and Sex Distribution of Seniors with Diabetes[1] and ≥ 1 Antihypertensive Drug Claim per Fiscal Year, Nova Scotia Seniors' Pharmacare, April 1, 1995 to March 31, 1996.[2]

Age Group (years)	Males		Females		Total Persons[3]	
	N	Study Population (%)	N	Study Population (%)	N	Study Population (%)
65 - 69	1,399	12.0	1,578	13.5	2,977	25.5
70 - 74	1,153	9.9	1,821	15.6	2,974	25.4
75 - 79	879	7.5	1,768	15.1	2,647	22.6
80 - 84	635	5.4	1,242	10.6	1,877	16.1
85+	321	2.7	901	7.7	1,222	10.4
Total	4,387	37.5	7,310	62.5	11,696	100.0

1 Seniors are identified by an administrative definition for pharmacologically or nonpharmacologically treated diabetes (i.e. at least one ICD-9 250 physician or hospital claim or at least one antidiabetic drug claim in the fiscal year) and have at least one claim for an antihypertensive drug in the specified fiscal year.
2 The selected drugs include the therapeutic groups C02, C03, C07, C08, and C09 of the 1997 World Health Organization Anatomical Therapeutic Chemical Index and are commonly used for the treatment of hypertension. The indication for drug treatment was unknown.
3 One persons was identified as both male and female on separate drug claims during the 1995/96 fiscal year.

Table 5. Antihypertensive Drug Use Among Diabetics in the Nova Scotia Seniors' Pharmacare Program[1], 1989 to 1995.

Fiscal Year	Pharmacare Beneficiaries Per Fiscal Year[2]	Diabetic Pharmacare Beneficiaries Treated with Antihypertensive Drugs Per Fiscal Year[3]		Total Pharmacare Expenditures Per Fiscal Year[4]	Antihypertensive Drug Expenditures for Diabetics Per Fiscal Year[5]		Antihypertensive Drug Expenditures per Diabetic Per Fiscal Year	
	N	N	% of Total Beneficiaries	$	$	% of Total Expenditures	Mean $	Standard Deviation $
1989	105,079	10,017	9.5%	71,975,793	3,569,119	5.0%	356.31	358.78
1990	106,022	10,234	9.7%	68,607,048	3,507,337	5.1%	342.71	347.59
1991	106,863	10,558	9.9%	66,530,991	3,520,265	5.3%	333.42	332.74
1992	108,058	10,967	10.1%	70,838,528	3,956,763	5.6%	360.79	352.07
1993	109,215	11,387	10.4%	66,156,383	4,003,953	6.1%	351.62	336.73
1994	102,439	11,118	10.9%	63,603,111	4,159,616	6.5%	374.13	343.97
1995	103,306	11,696	11.3%	70,539,192	4,744,207	6.7%	405.63	372.72
Total		22,451		478,251,047	27,461,261			

1 Nova Scotia Seniors' Pharmacare provides coverage for eligible residents who are 65 years of age and over.

2 Persons are counted once in each fiscal year with at least one specified type of drug claim. Fiscal year is April 1 to March 31.

3 Seniors are identified by an administrative definition for pharmacologically or nonpharmacologically treated diabetes (i.e. at least one ICD-9 250 physician or hospital claim or at least one antidiabetic drug claim in the fiscal year) and have at least one claim for an antihypertensive drug in the specified fiscal year.

4 Total approved expenditures for Nova Scotia Seniors' Pharmacare include reimbursed drug costs and professional fees and exclude copayments paid by seniors. Copayments vary during the study time period.

5 Total study population was 22,451. Persons were counted once between 1989 and 1995.

Table 6. Use of Antihypertensive Drugs in Diabetics and Total Pharmacare Beneficiaries, Nova Scotia Seniors' Pharmacare, 1989 to 1995.[1]

Fiscal Year[2]	Antihypertensive Drug Category[3]	Diabetic Users[4]		Pharmacare Beneficiaries[5]	
		N	Rate/1,000	N	Rate/1,000
1989/90	Antiadrenergics	1,359	134.8	6,268	63.6
	Low Ceiling Diuretics	1,677	167.2	10,351	105.3
	High Ceiling Diuretics	2,618	264.2	10,803	111.5
	Potassium-Sparing Diuretics	260	26.0	953	9.7
	Beta-blockers	3,210	318.3	18,588	186.4
	Calcium Channel Blockers	2,899	289.1	14,541	146.8
	Angiotensin Converting Enzyme Inhibitors	2,164	215.9	9,978	100.9
	Antihypertensive Combinations	3,901	388.1	24,331	246.9
	Total Antihypertensive Drug Users	10,017	1,000	59,389	602.0
	Total Pharmacare Beneficiaries			99,163	
1990/91	Antiadrenergics	1,200	116.8	5,606	56.1
	Low Ceiling Diuretics	1,629	159.0	9,664	97.0
	High Ceiling Diuretics	2,669	263.3	10,972	111.3
	Potassium-Sparing Diuretics	253	24.7	960	9.7
	Beta-blockers	3,215	312.4	18,372	182.4
	Calcium Channel Blockers	3,369	328.7	16,808	167.7
	Angiotensin Converting Enzyme Inhibitors	2,554	249.3	11,651	116.3
	Antihypertensive Combinations	3,576	348.5	22,478	225.2
	Total Antihypertensive Drug Users	10,234	1,000	59,869	599.0
	Total Pharmacare Beneficiaries			100,306	
1991/92	Antiadrenergics	1,100	103.9	5,035	49.7
	Low Ceiling Diuretics	1,533	144.9	9,234	91.2
	High Ceiling Diuretics	2,888	275.0	11,555	114.9
	Potassium-Sparing Diuretics	256	24.3	950	9.4
	Beta-blockers	3,252	307.2	18,542	182.4

1 The magnitude of rates may not be compared directly due to differences in standard populations.

2 Fiscal Year is April 1 to March 31.

3 The selected drugs include the therapeutic groups C02, C03, C07, C08, C09 of the 1997 World Health Organization Anatomical Therapeutic Chemical Index and may be used for the treatment of hypertension. The indication for drug treatment was unknown.

4 Rates are the number of diabetic seniors with at least one drug claim per antihypertensive drug category per 1,000 total seniors with diabetes and at least one drug claim for a selected antihypertensive drug per fiscal year. Rates are age and sex standardized to the 1992 fiscal year population of diabetic seniors with at least one claim for a selected antihypertensive drug. Seniors are identified by an administrative definition for pharmacologically or nonpharmacologically treated diabetes (i.e. at least one ICD-9 250 physician or hospital claim or at least one antidiabetic drug claim in the fiscal year) and have at least one claim for an antihypertensive drug in the specified fiscal year. Includes persons who were less than 65 years of age at beginning of fiscal year.

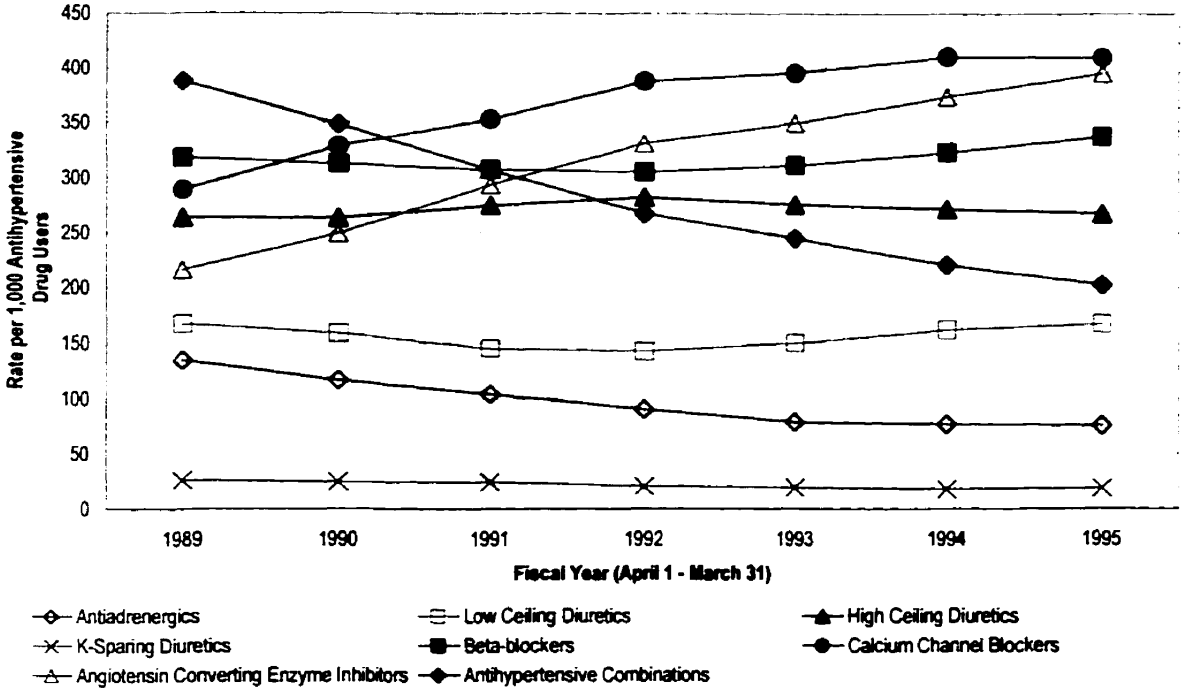
5 Rates are the number of seniors with at least one drug claim per antihypertensive drug category per 1,000 total Pharmacare beneficiaries with at least one Pharmacare drug claim per fiscal year. Rates are age and sex standardized to the 1992 fiscal year population of seniors with at least one Pharmacare drug claim. Excludes persons who were less than 65 years of age at beginning of fiscal year.

Table 6 continued....

Fiscal Year	Antihypertensive Drug Category	Diabetic Users		Pharmacare Beneficiaries	
		N	Rate/1,000	N	Rate/1,000
1991/92	Calcium Channel Blockers	3,731	353.2	18,820	185.6
	Angiotensin Converting Enzyme Inhibitors	3,101	293.6	13,888	136.9
	Antihypertensive Combinations	3,245	306.9	20,526	202.8
	Total Antihypertensive Drug Users	10,559	1,000	60,680	599.0
	Total Pharmacare Beneficiaries			101,484	
1992/93	Antiadrenergics	988	90.1	4,501	43.8
	Low Ceiling Diuretics	1,566	142.8	9,275	90.3
	High Ceiling Diuretics	3,096	282.3	12,225	119.0
	Potassium-Sparing Diuretics	225	20.5	905	8.8
	Beta-blockers	3,344	304.9	18,903	184.0
	Calcium Channel Blockers	4,258	388.3	20,803	202.5
	Angiotensin Converting Enzyme Inhibitors	3,631	331.1	16,169	157.4
	Antihypertensive Combinations	2,932	267.3	18,826	183.3
	Total Antihypertensive Drug Users	10,967	1,000	61,929	602.9
	Total Pharmacare Beneficiaries			102,714	
1993/94	Antiadrenergics	897	78.8	4,132	39.6
	Low Ceiling Diuretics	1,713	150.3	9,854	94.2
	High Ceiling Diuretics	3,147	275.7	12,604	119.6
	Potassium-Sparing Diuretics	221	19.4	900	8.6
	Beta-blockers	3,538	311.2	19,581	188.4
	Calcium Channel Blockers	4,507	396.0	22,005	211.1
	Angiotensin Converting Enzyme Inhibitors	3,982	349.7	17,451	167.2
	Antihypertensive Combinations	2,788	244.7	17,377	166.1
	Total Antihypertensive Drug Users	11,387	1,000	63,054	604.0
	Total Pharmacare Beneficiaries			104,179	
1994/95	Antiadrenergics	854	76.6	3,773	38.6
	Low Ceiling Diuretics	1,824	162.2	10,238	102.8
	High Ceiling Diuretics	3,037	271.4	11,807	117.9
	Potassium-Sparing Diuretics	202	17.7	805	8.1
	Beta-blockers	3,565	322.9	19,011	196.0
	Calcium Channel Blockers	4,556	411.0	21,371	219.7
	Angiotensin Converting Enzyme Inhibitors	4,170	374.1	17,641	180.0
	Antihypertensive Combinations	2,478	220.4	15,174	151.6
	Total Antihypertensive Drug Users	11,118	1,000	59,850	609.1
	Total Pharmacare Beneficiaries			97,535	
1995/96	Antiadrenergics	873	75.7	3,804	39.2
	Low Ceiling Diuretics	1,972	167.3	10,886	108.0
	High Ceiling Diuretics	3,143	267.3	11,893	116.6
	Potassium-Sparing Diuretics	220	18.7	783	7.8
	Beta-blockers	3,929	337.4	20,418	208.2
	Calcium Channel Blockers	4,790	410.1	22,027	223.7
	Angiotensin Converting Enzyme Inhibitors	4,625	395.7	18,952	191.3
	Angiotensin-II Antagonists	4	1.3	13	0.1
	Antihypertensive Combinations	2,388	202.1	14,087	138.9
	Total Antihypertensive Drug Users	11,697	1,000	61,200	615.9
	Total Pharmacare Beneficiaries			98,638	

Appendix II: Figures

Figure 1. Use of Antihypertensive Drugs in Diabetics[1], Nova Scotia Seniors' Pharmacare, 1989 to 1995.[2,3]



1 Seniors are identified by an administrative definition for pharmacologically or nonpharmacologically treated diabetes (i.e. at least one ICD-9 250 physician or hospital claim or at least one antidiabetic drug claim in the fiscal year) and have at least one claim for an antihypertensive drug in the specified fiscal year.
2 The selected drugs include the therapeutic groups C02, C03, C07, C08, C09 of the 1997 World Health Organization Anatomical Therapeutic Chemical Index and may be used for the treatment of hypertension. The indication for drug treatment was unknown. Use of fixed combination preparations are only represented in the category for antihypertensive combinations, all other categories reflect the use of single-entity drug preparations.
3 Rates are the number of diabetic seniors with at least one drug claim per antihypertensive drug category per 1,000 total seniors with diabetes and at least one drug claim for any selected antihypertensive drug per fiscal year April 1 – March 31. Rates are directly standardized to the age and sex distribution of the 1992 study population of diabetic seniors with at least one drug claim for a selected antihypertensive drug.

Appendix III: Antidiabetic and Antihypertensive Drug Preparations with Drug Identification Number[1]

Antidiabetic Drugs

1900927 ALBERT GLYBURIDE TAB 2.5MG
1900935 ALBERT GLYBURIDE TAB 5MG
399302 APO CHLORPROPAMIDE TAB 100MG
312711 APO CHLORPROPAMIDE TAB 250MG
1913654 APO GLYBURIDE TAB 2.5MG
1913662 APO GLYBURIDE TAB 5MG
312762 APO TOLBUTAMIDE TAB 500MG
2167786 APO-METFORMIN - TAB 500MG
12599 DIABETA TAB 5MG
454753 DIABETA TAB 2.5MG
1987836 DIABETA TAB 5MG
1987534 DIABETA TABLETS 2.5MG
24708 DIABINESE TAB 100MG
24716 DIABINESE TAB 250MG
765996 DIAMICRON TAB 80MG
15598 DIMELOR TAB 50 MG
720933 EUGLUCON TAB
720941 EUGLUCON TAB
480304 EUGLUCON TAB 2.5MG
420336 EUGLUCON TAB 5MG
480290 EUGLUCON TAB 5MG
808733 GEN GLYBE TAB 2.5MG
808741 GEN GLYBE TAB 5MG
2148765 GEN-METFORMIN - TAB 500MG
314552 GLUCOPHAGE TAB 500MG
2099233 GLUCOPHAGE TAB 500MG
1962639 HUMULIN 10/90 CARTRIDGE
889113 HUMULIN 10/90 INJ
1962655 HUMULIN 20/80 CARTRIDGE
889105 HUMULIN 20/80 INJ
1959212 HUMULIN 30/70 CARTRIDGE
795879 HUMULIN 30/70(INSULIN HUMAN BIOSYNTH INJ
1962647 HUMULIN 40/60 CARTRIDGE
889091 HUMULIN 40/60 INJ
1962663 HUMULIN 50/50 CARTRIDGE
889121 HUMULIN 50/50 INJ
646148 HUMULIN L LENTE INJ 100UNIT/ML
1959239 HUMULIN N CARTRIDGE
587737 HUMULIN N INJ 100UNIT/ML
1959220 HUMULIN R CARTRIDGE
1985949 INSULATARD NPH NORDISK INJ SUSP 100U/ML
552275 INSULIN INSULATARD NORDISK INJ
552259 INSULIN MIXTARD NORDISK INJ
5894 INSULIN TORONTO 100 UNIT/ML(BEEF&PORK)
546348 INSULIN TORONTO BEEF 100UNIT/ML
612227 INSULIN TORONTO INJ 100UNIT/ML
552267 INSULIN VELOSULIN NORDISK INJ
539244 INSULIN-TORONTO INJ
1934112 INSULIN-TORONTO INJ 100U/ML
542911 LENTE INSULIN INJ
1934090 LENTE INSULIN INJ 100U/ML
612278 LENTE INSULIN INJ 100UNIT/ML
275409 LENTE INSULIN ZINC SUSP 100IU/ML
514535 LENTE PURIFIED PORK INSULIN INJ
773654 MIXTARD 15/85 HUMAN INJ
632694 MIXTARD 30/70 HUMAN INJ
1986821 MIXTARD 30/70 HUMAN INJ SUSP
632678 MIXTARD 50/50 HUMAN INJ
1985965 MIXTARD 50/50 HUMAN INJ SUSP
977713 MIXTARD INSUJECT
1985957 MIXTARD NORDISK INJ SUSP
13889 MOBENOL TABLETS 500MG
21849 NOVO-BUTAMIDE 500MG
1913670 NOVO-GLYBURIDE TAB 2.5MG
1913689 NOVO-GLYBURIDE TAB 5MG
650935 NOVOLIN 30/70 INJ 100 UNIT/ML
977683 NOVOLIN 30/70 PENFILL
2024292 NOVOLIN GE 10/90 PENFILL INJ SUSP
2024306 NOVOLIN GE 20/80 PENFILL INJ SUSP
2024217 NOVOLIN GE 30/70 INJ SUSP
2025248 NOVOLIN GE 30/70 PENFILL INJ SUSP
2024314 NOVOLIN GE 40/60 PENFILL INJ SUSP
2024322 NOVOLIN GE 50/50 PENFILL SUS INJ
2024241 NOVOLIN GE LENTE INJ SC 100U/ML
2024225 NOVOLIN GE NPH INJ SUS 100U/ML
2024268 NOVOLIN GE NPH PENFILL INJ SUS 100U/ML
2024233 NOVOLIN GE TORONTO INJ 100U/ML
2024284 NOVOLIN GE TORONTO PENFILL INJ LIQ 100U/ML
2024276 NOVOLIN GE ULTRALENTE INJ SUSP 100U/ML
612197 NOVOLIN NPH INJ 100UNIT/ML SUSP

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1 Not all of the DINs listed in this appendix correspond to a Pharmacare claim during the study period.

586714 HUMULIN R INJ
733075 HUMULIN-U ULTRALENTE INJ 100UNIT/ML
446564 ILETIN INSULIN REGULAR 100UNIT/ML
446580 ILETIN LENTE INSULIN INJ 100UNIT/ML
446572 ILETIN NPH INSULIN 100UNIT/ML
446610 ILETIN PROTAMINE ZINC INJ 100UNIT/ML
446602 ILETIN SEMILENTE INSULIN INJ 100UNIT/ML
614416 INITARD
632651 INSULATARD HUMAN INJ 100UNIT/ML
977691 INSULATARD INSUJECT
274127 NPH INSULIN PORK 100IU/ML
542946 NPH INSULIN PORK INJ 100UNIT/ML
514551 NPH PURIFIED PORK INSULIN INJ
2020734 NU-GLYBURIDE TAB 2.5MG
2020742 NU-GLYBURIDE TAB 5MG
2162822 NU-METFORMIN - TAB 500MG
1987542 ORINASE 0.5G TAB
12602 ORINASE 0.5G TAB
1987828 ORINASE IG TAB
12610 ORINASE IG TAB
274119 PROTAMINE ZINC INSULIN (PORK) 100IU/ML
612219 PROTAMINE ZINC INSULIN INJ 100UNIT/ML SUSP
513644 REGULAR PURIFIED PORK INSULIN INJ
1934082 SEMILENTE INSULIN INJ 100U/ML
612251 SEMILENTE INSULIN INJ 100UNIT/ML
275417 SEMILENTE INSULIN SUSP RAPID 100IU/ML
6009 SULPHATED INSULIN 100UNIT/ML
648094 SULPHATED INSULIN INJ 100UNIT/ML (BEEF)
1934074 SULPHATED INSULIN INJ LIQ 100U/ML
1934104 ULTRALENTE INSULIN INJ 100U/ML
612243 ULTRALENTE INSULIN INJ 100UNIT/ML
275425 ULTRALENTE INSULIN ZINC SUSp PROLONGED INJ
632686 VELOSULIN HUMAN INJ 100UNIT/ML
977705 VELOSULIN INSUJECT
977675 NOVOLIN NPH PENFILL
977667 NOVOLIN TORONTO PENFILL
644358 NOVOLIN ULTRALENTE SUSP 100UNITS/ML
612200 NOVOLIN-LENTE INJ 100UNIT/ML
612189 NOVOLIN-TORONTO INJ 100UNIT/ML
2045710 NOVO-METFORMIN TAB 500MG
21350 NOVO-PROPAMIDE 250MG
1934066 NPH INSULIN INJ 100U/ML
542938 NPH INSULIN INJ 100UNIT/ML
612235 NPH INSULIN INJ 100UNIT/ML SUSP

Antihypertensive Drugs

1947672 ACCUPRIL TAB 10 MG
1947680 ACCUPRIL TAB 20 MG
1947699 ACCUPRIL TAB 40 MG
1947664 ACCUPRIL TAB 5 MG
2164426 ACEBUTOLOL - 400 - TAB 400 MG
2164396 ACEBUTOLOL-100-TAB 100 MG
2164418 ACEBUTOLOL-200 - TAB 200 MG
557633 ADALAT CAP 10 MG
2155877 ADALAT CAP 10 MG
613258 ADALAT CAP 5 MG
2155869 ADALAT CAP 5 MG
852082 ADALAT FT TAB 10 MG
692727 ADALAT PA 10 TAB 10 MG
692735 ADALAT PA 20 SRT 20 MG
2155885 ADALAT PA SRT 10 MG
2155893 ADALAT PA SRT 20 MG
2155907 ADALAT XL SRT 30 MG
1913131 ADALAT XL SRT 30 MG
2155990 ADALAT XL SRT 60 MG
1913158 ADALAT XL SRT 60 MG
594377 ALDACTAZIDE 50/50 MG
180408 ALDACTAZIDE-25/25 MG
285455 ALDACTONE TAB 100 MG
28606 ALDACTONE TAB 25 MG
16551 ALDOMET TAB 125 MG
16578 ALDOMET TAB 250 MG
16586 ALDOMET TAB 500 MG
140589 ALDORIL 15 TAB 250/15 MG
140597 ALDORIL 25 TAB 250/25 MG
2050943 ALTACE CAP 1.25 MG
2050986 ALTACE CAP 10 MG
2221853 ALTACE CAP 10 MG
2050951 ALTACE CAP 2.5 MG
2221837 ALTACE CAP 2.5 MG
2050978 ALTACE CAP 5 MG
2221845 ALTACE CAP 5 MG
2174596 ALTI-[OR SYN-]-AMILORIDE HCTZ TAB 50/5 MG
851639 ALTI-CAPTOPRIL (OR SYN) TAB 12.5 MG
851833 ALTI-CAPTOPRIL TAB 25 MG
851647 ALTI-CAPTOPRIL TAB 50 MG
851655 ALTI-CAPTOPRIL(OR SYN) TAB 100 MG
2229781 ALTI-DILTIAZEM CD 120 MG
2229782 ALTI-DILTIAZEM CD 180 MG
2229783 ALTI-DILTIAZEM CD 240 MG
2229784 ALTI-DILTIAZEM CD 300 MG
888524 ALTI-DILTIAZEM TAB 30 MG
888532 ALTI-DILTIAZEM TAB 60 MG
851698 ALTI-NADOLOL TAB 160 MG
851663 ALTI-NADOLOL TAB 40 MG
851671 ALTI-NADOLOL TAB 80 MG
360287 APO-CHLORTHALIDONE TAB 100 MG
868949 APO-CLONIDINE TAB 0.1 MG
868957 APO-CLONIDINE TAB 0.2 MG
2230997 APO-DILTIAZ CD 120 MG
2230998 APO-DILTIAZ CD 180 MG
2230999 APO-DILTIAZ CD 240 MG
2229526 APO-DILTIAZ CD 300 MG
2222965 APO-DILTIAZ SR SRC 90 MG
2222973 APO-DILTIAZ SR SRC 120 MG
2222957 APO-DILTIAZ SR SRC 60 MG
2019892 APO-ENALAPRIL TAB 10 MG
2020025 APO-ENALAPRIL TAB 2.5 MG
2019906 APO-ENALAPRIL TAB 20 MG
2019884 APO-ENALAPRIL TAB 5 MG
396788 APO-FUROSEMIDE TAB 20 MG
362166 APO-FUROSEMIDE TAB 40 MG
707570 APO-FUROSEMIDE TAB 80 MG
396745 APO-GUANETHIDINE 10MG TAB
396753 APO-GUANETHIDINE SULFATE TAB 25 MG
441619 APO-HYDRAL TAB 10 MG
441627 APO-HYDRALAZINE TAB 25 MG
441635 APO-HYDRALAZINE TAB 50 MG
326844 APO-HYDRO 25MG TAB
644552 APO-HYDRO TAB 100 MG
312800 APO-HYDRO TAB 50MG
2217996 APO-LISINOPRIL (TYPE P) TAB 5 MG
2217511 APO-LISINOPRIL (TYPE Z) TAB 20 MG
2217538 APO-LISINOPRIL (TYPE Z) TAB 40MG
2218003 APO-LISINOPRIL (TYPE P) TAB 10 MG
2218038 APO-LISINOPRIL (TYPE P) TAB 40MG
2217481 APO-LISINOPRIL (TYPE Z) TAB 5 MG
2217503 APO-LISINOPRIL (TYPE Z) TAB 10 MG
2218011 APO-LISINOPRIL (TYPE Z) TAB 20 MG
441708 APO-METHAZIDE 15MG TAB 250/15 MG
441716 APO-METHAZIDE 25 TAB 250/25 MG
751170 APO-METOPROLOL-L TAB 100 MG
749354 APO-METOPROLOL-L TAB 50 MG
782475 APO-NADOL TAB 160 MG
782505 APO-NADOL TAB 40 MG
782467 APO-NADOL TAB 80 MG
755907 APO-NIFED CAP 10 MG
725110 APO-NIFED CAP 5 MG
2181525 APO-NIFED PA SRT 20 MG
2197448 APO-NIFED PA TAB 10 MG
755885 APO-PINDOL TAB 10 MG
755893 APO-PINDOL TAB 15 MG
755877 APO-PINDOL TAB 5 MG
882801 APO-PRAZO TAB 1 MG
882828 APO-PRAZO TAB 2 MG
2139979 ALTI-PRAZOSIN TAB 1 MG

2139987 ALTI-PRAZOSIN TAB 2 MG
2139995 ALTI-PRAZOSIN TAB 5 MG
2084236 ALTI-SOTALOL TAB 160 MG
2084228 ALTI-SOTALOL TAB 80 MG
867365 ALTI-VERAPAMIL - 80MG
867373 ALTI-VERAPAMIL TAB 120 MG
870943 AMI-HYDRO TAB 50/5 MG
771376 APO DILTIAZ TAB 30 MG
771384 APO DILTIAZ TAB 60 MG
360252 APO METHYLDOPA TAB 125 MG
360260 APO METHYLDOPA TAB 250 MG
426830 APO METHYLDOPA TAB 500 MG
618640 APO METOPROLOL TAB 100 MG
618632 APO METOPROLOL TAB 50 MG
402788 APO PROPRANOLOL TAB 10 MG
504335 APO PROPRANOLOL TAB 120 MG
402753 APO PROPRANOLOL TAB 40 MG
402761 APO PROPRANOLOL TAB 80 MG
2147629 APO-ACEBUTOLOL TAB 400 MG
2147602 APO-ACEBUTOLOL TABLETS 100 MG
2147610 APO-ACEBUTOLOL TABLETS 200 MG
784400 APO-AMILZIDE TAB 50/5 MG
773697 APO-ATENOL TAB 100 MG
773689 APO-ATENOL TAB 50 MG
893625 APO-CAPTO TAB 100 MG
893595 APO-CAPTO TAB 12.5 MG
893609 APO-CAPTO TAB 25 MG
893617 APO-CAPTO TAB 50 MG
1999559 APO-CAPTO TAB 6.25 MG
360279 APO-CHLORTHALIDONE 50 MG
882836 APO-PRAZO TAB 5 MG
663719 APO-PROPRANOLOL TAB 20 MG
2167794 APO-SOTALOL TAB 160 MG
2210428 APO-SOTALOL TAB 80 MG
520802 APO-SPIROZIDE TAB 25/25 MG
755850 APO-TIMOL TAB 10 MG
755869 APO-TIMOL TABLETS 20 MG
755842 APO-TIMOL TABLETS 5 MG
441775 APO-TRIAZIDE 25/50 TAB
782491 APO-VERAP TAB 120 MG
782483 APO-VERAP TAB 80 MG
723754 APRESOLINE INJ 20 MG/AMP
5274 APRESOLINE INJ 20MG/ML
5525 APRESOLINE TAB 10 MG
5533 APRESOLINE TAB 25 MG
5541 APRESOLINE TAB 50 MG
14990 AQUAMOX TAB 50 MG
128015 AQUAMOX WITH RESERPINE
13072 ARFONAD INJ 500 MG/10ML
2230077 ATENOLOL TAB 100 MG

2139987 ALTI-PRAZOSIN TAB 2 MG
2139995 ALTI-PRAZOSIN TAB 5 MG
2084236 ALTI-SOTALOL TAB 160 MG
2084228 ALTI-SOTALOL TAB 80 MG
867365 ALTI-VERAPAMIL - 80MG
867373 ALTI-VERAPAMIL TAB 120 MG
870943 AMI-HYDRO TAB 50/5 MG
771376 APO DILTIAZ TAB 30 MG
771384 APO DILTIAZ TAB 60 MG
360252 APO METHYLDOPA TAB 125 MG
360260 APO METHYLDOPA TAB 250 MG
426830 APO METHYLDOPA TAB 500 MG
618640 APO METOPROLOL TAB 100 MG
618632 APO METOPROLOL TAB 50 MG
402788 APO PROPRANOLOL TAB 10 MG
504335 APO PROPRANOLOL TAB 120 MG
402753 APO PROPRANOLOL TAB 40 MG
402761 APO PROPRANOLOL TAB 80 MG
2147629 APO-ACEBUTOLOL TAB 400 MG
2147602 APO-ACEBUTOLOL TABLETS 100 MG
2147610 APO-ACEBUTOLOL TABLETS 200 MG
784400 APO-AMILZIDE TAB 50/5 MG
773697 APO-ATENOL TAB 100 MG
773689 APO-ATENOL TAB 50 MG
893625 APO-CAPTO TAB 100 MG
893595 APO-CAPTO TAB 12.5 MG
893609 APO-CAPTO TAB 25 MG
893617 APO-CAPTO TAB 50 MG
1999559 APO-CAPTO TAB 6.25 MG
360279 APO-CHLORTHALIDONE 50 MG
882836 APO-PRAZO TAB 5 MG
663719 APO-PROPRANOLOL TAB 20 MG
2167794 APO-SOTALOL TAB 160 MG
2210428 APO-SOTALOL TAB 80 MG
520802 APO-SPIROZIDE TAB 25/25 MG
755850 APO-TIMOL TAB 10 MG
755869 APO-TIMOL TABLETS 20 MG
755842 APO-TIMOL TABLETS 5 MG
441775 APO-TRIAZIDE 25/50 TAB
782491 APO-VERAP TAB 120 MG
782483 APO-VERAP TAB 80 MG
723754 APRESOLINE INJ 20 MG/AMP
5274 APRESOLINE INJ 20MG/ML
5525 APRESOLINE TAB 10 MG
5533 APRESOLINE TAB 25 MG
5541 APRESOLINE TAB 50 MG
14990 AQUAMOX TAB 50 MG
128015 AQUAMOX WITH RESERPINE
13072 ARFONAD INJ 500 MG/10ML
1958097 CARDURA-2 M G TAB

1958119 CARDURA-4 4 MG TAB
291889 CATAPRES 0.2 TAB 0.2 MG
259527 CATAPRES TAB 0.1 MG
398373 CHLORTHALIDONE TAB 100 MG
431001 CHLORTHALIDONE TAB 100 MG
451797 CHLORTHALIDONE TAB 100 MG
398365 CHLORTHALIDONE TAB 50 MG
430994 CHLORTHALIDONE TAB 50 MG
451789 CHLORTHALIDONE TAB 50 MG
1910396 CLONIDINE HCL TAB 0.1 MG
1908162 CLONIDINE HCL TAB 0.2 MG
291870 COMBIPRES 0.1/15 TAB
523372 CORGARD TAB 160 MG
607126 CORGARD TAB 40 MG
463256 CORGARD TAB 80 MG
593338 CORZIDE TAB W NADOLOL 40 MG/5 MG
593311 CORZIDE TAB W NADOLOL 80 MG/5 MG
2123274 COVERSYL TAB 2 MG
2123282 COVERSYL TAB 4 MG
2182815 COZAAR TAB 25 MG
2182874 COZAAR TAB 50 MG
255432 DECLINAX TAB 10MG
2129035 DEMADEX TAB 100 MG
2129019 DEMADEX TAB 10 MG
2129027 DEMADEX TAB 20 MG
2129000 DEMADEX TAB 5 MG
511560 DETENSOL TAB 10 MG
511595 DETENSOL TAB 120 MG
511579 DETENSOL TAB 40 MG
511587 DETENSOL TAB 80 MG
2230031 DILTIAZEM TAB 30 MG
2230032 DILTIAZEM TAB 60 MG
828785 DILTIAZEM-30 TAB 30 MG
828777 DILTIAZEM-60 TAB 60 MG
134341 DIUCHLOR H TAB 50 MG
343854 DIURIL TAB 500MG
519251 DIXARIT TAB 0.025 MG
2229467 DOM-ATENOLOL 50 MG
2229468 DOM-ATENOLOL 100 MG
2172569 DOM-METOPROLOL-B TAB 100MG
2172550 DOM-METOPROLOL-B TAB 50 MG
2137313 DOM-PROPRANOLOL TAB 10 MG
2137321 DOM-PROPRANOLOL TAB 40 MG
2137348 DOM-PROPRANOLOL TAB 80 MG
353620 DOPAMET TAB 125 MG
250392 DOPAMET TAB 250 MG
353639 DOPAMET TAB 500 MG
485 DURETIC TAB 5 MG
38997 DURETICYL
1919547 DYAZIDE TAB 25/50 MG
181528 DYAZIDE TAB 25/50 MG
27138 DYRENIUM 100 MG
1919571 DYRENIUM 100MG TAB
299715 DYRENIUM 50 TABLETS
1919563 DYRENIUM 50MG TAB
16497 EDECRIN TAB 50 MG
5568 ESIDRIX TAB 25MG
527033 FUROSEMIDE INJ 10 MG/ML
565040 FUROSEMIDE INJ 10 MG/ML
489131 FUROSEMIDE TAB 20 MG
496723 FUROSEMIDE TAB 20 MG
396249 FUROSEMIDE TAB 40 MG
397792 FUROSEMIDE TAB 40 MG
1900943 FUROSEMIDE TAB 40 MG
431052 FUROSEMIDE TAB 40 MG
353612 FUROSIDE TAB 20 MG
332275 FUROSIDE TAB 40 MG
1946307 GEN NIFEDIPINE CAP 10 MG
2147432 GEN-ATENOLOL TAB 100 MG
2146894 GEN-ATENOLOL TAB 50 MG
2163578 GEN-CAPTOPRIL - TAB 25 MG
2163594 GEN-CAPTOPRIL - TAB 100 MG
2163551 GEN-CAPTOPRIL - TAB 12.5 MG
2163586 GEN-CAPTOPRIL - TAB 50 MG
2146916 GEN-DILTIAZEM TAB 30 MG
2146924 GEN-DILTIAZEM TAB 60 MG
2153483 GEN-INDAPAMIDE TAB 2.5MG
2174553 GEN-METOPROLOL (TYPE L) TAB 100 MG
2174545 GEN-METOPROLOL (TYPE L) TAB 50 MG
2057816 GEN-PINDOLOL TAB 10 MG
2057824 GEN-PINDOLOL TAB 15 MG
2057808 GEN-PINDOLOL TAB 5 MG
2229779 GEN-SOTALOL TAB 160 MG
2229780 GEN-SOTALOL TAB 240 MG
2229778 GEN-SOTALOL TAB 80 MG
2210347 GEN-VERAPAMIL SR 120 MG SRT
2210355 GEN-VERAPAMIL SR SRT 180 MG
2210363 GEN-VERAPAMIL SR SRT 240 MG
607983 GUANETHIDINE 10 TAB 10MG
607991 GUANETHIDINE 25 TAB 25 MG
1913638 HYDRALAZINE-10 TAB 10 MG
2082071 HYDRALAZINE-25 TAB 25 MG
2082098 HYDRALAZINE-50 TAB 50 MG
532088 HYDROCHLOROTHIAZIDE TAB 100 MG
92681 HYDROCHLOROTHIAZIDE TAB 25 MG
209813 HYDROCHLOROTHIAZIDE TAB 25 MG
431060 HYDROCHLOROTHIAZIDE TAB 25 MG
92703 HYDROCHLOROTHIAZIDE TAB 50 MG
209821 HYDROCHLOROTHIAZIDE TAB 50 MG
431079 HYDROCHLOROTHIAZIDE TAB 50 MG

16500 HYDRODIURIL 25 MG TAB
354317 HYDRODIURIL TAB 100MG
16519 HYDRODIURIL TAB 50MG
140619 HYDROPRES-25 TAB 0.125/25 MG
140627 HYDROPRES-50 TAB 0.125/50 MG
10421 HYGROTON TAB 100 MG
110108 HYGROTON RESERPINE 0.25/50 MG
10413 HYGROTON TAB 50 MG
818658 HYTRIN TAB 1 MG
818674 HYTRIN TAB 10 MG
818682 HYTRIN TAB 2 MG
818666 HYTRIN TAB 5 MG
2187876 HYTRIN-7 TABS 1MG-7 TABS 2MG-14 TABS 5MG
2049341 INDAPAMIDE HEMIHYDRATE TAB 2.5 MG
489859 INDERAL 20 TAB 20 MG
313602 INDERAL 80 TAB 80 MG
587931 INDERAL LA SRC 120 MG
511668 INDERAL LA SRC 160 MG
2658 INDERAL TAB 10 MG
456578 INDERAL TAB 120 MG
2666 INDERAL TAB 40 MG
2042177 INDERAL-10 TAB 10 MG
2042223 INDERAL-120 TAB 120 MG
2042193 INDERAL-20 TAB 20 MG
2042207 INDERAL-40 TAB 40 MG
2042215 INDERAL-80 TAB 80 MG
2042266 INDERAL-LA SRC 120 MG
2042274 INDERAL-LA SRC 160 MG
2042231 INDERAL-LA SRC 60 MG
885770 INDERAL-LA SRC 60 MG
566950 INDERAL-LA SRC 80 MG
2042258 INDERAL-LA SRC 80 MG
465313 INDERIDE TAB 40/25 MG
465321 INDERIDE TAB 80/25 MG
2042282 INDERIDE-40 TAB 40/25 MG
2042290 INDERIDE-80 TAB 80/25 MG
1911465 INHIBACE TAB 1 MG
1911473 INHIBACE TAB 2.5 MG
1911481 INHIBACE TAB 5 MG
74365 ISMELIN ESIDRIX 10/25 MG
5509 ISMELIN TAB 10 MG
5517 ISMELIN TAB 25 MG
1934317 ISOPTIN SR SRT 180 MG
742554 ISOPTIN SR SRT 240 MG
1907123 ISOPTIN SR TAB 120MG SRT
554324 ISOPTIN TAB 120MG
554316 ISOPTIN TAB 80 MG
1988832 LASIX INJ 10 MG/ML
1987798 LASIX 40MG TAB
1996436 LASIX INJ 10 MG/ML
217743 LASIX MULTI DOSE VIAL INJ 10MG/ML
432342 LASIX ORAL SOLUTION 10 MG/ML
1987585 LASIX SOL 10 MG/ML
1987615 LASIX SPECIAL TAB 500MG
380016 LASIX SPECIAL TAB 500 MG
289590 LASIX TAB 20 MG
1987739 LASIX TAB 20MG
12580 LASIX TAB 40 MG
397687 LASIX TAB 80 MG
1987771 LASIX TAB 80MG
2170841 LINSOTALOL TAB 160 MG
2170833 LINSOTALOL TAB 80 MG
514500 LONITEN TAB 10 MG
514497 LONITEN TAB 2.5 MG
590819 LOPRESOR INJ 1 MG/ML
658855 LOPRESOR SR 100 MG
534560 LOPRESOR SR TAB 200 MG
397431 LOPRESOR TAB 100 MG
397423 LOPRESOR TAB 50 MG
885843 LOTENSIN TAB 10 MG
885851 LOTENSIN TAB 20 MG
885835 LOTENSIN TAB 5 MG
2179709 LOZIDE TAB 1.25 MG
564966 LOZIDE TAB 2.5 MG
2188988 MED ATENOLOL TAB 100 MG
2188961 MED ATENOLOL TAB 50 MG
2188929 MED CAPTOPRIL - TAB 12.5 MG
2188953 MED CAPTOPRIL - TAB 100 MG
2188937 MED CAPTOPRIL - TAB 25 MG
2188945 MED CAPTOPRIL - TAB 50 MG
2189038 MED DILTIAZEM TAB 30 MG
2189046 MED DILTIAZEM TAB 60 MG
385077 MEDIMET TAB 250 MG
456365 METHYLDOPA TAB 125 MG
456373 METHYLDOPA 500 TAB 500 MG
453714 METHYLDOPA TAB 250
456012 METHYLDOPA TAB 125 MG
492957 METHYLDOPA TAB 125 MG
456004 METHYLDOPA TAB 250 MG
487023 METHYLDOPA TAB 250 MG
456020 METHYLDOPA TAB 500 MG
492965 METHYLDOPA TAB 500 MG
648027 METOPROLOL-100 TAB 100 MG
648019 METOPROLOL-50 TAB 50 MG
487805 MIDAMOR 5 MG TAB
381527 MINIPRESS CAP 1 MG
381535 MINIPRESS CAP 2MG
381551 MINIPRESS CAP 5MG
560952 MINIPRESS TAB 1 MG
560960 MINIPRESS TAB 2 MG

560979 MINIPRESS TAB 5 MG
487813 MODURET TAB 50/5 MG
2036290 MONITAN 100 TAB 100 MG
2036436 MONITAN 200 TAB 200 MG
2036444 MONITAN 400 TAB 400 MG
695645 MONITAN TAB 100 MG
695653 MONITAN TAB 200 MG
771341 MONITAN TAB 400 MG
1907107 MONOPRIL TAB 10 MG
1907115 MONOPRIL TAB 20 MG
818720 NADOLOL-160 TAB 160 MG
828815 NADOLOL-40 TAB 40 MG
818704 NADOLOL-80 TAB 80 MG
184233 NATURETIN K TAB 5/500 MG
29343 NATURETIN TAB 5 MG
18848 NEO-CODEMA TAB 25 MG
18856 NEO-CODEMA TAB 50 MG
882860 NEO-DIUREX TAB 25/50 MG
1910221 NIFEDIPINE CAP 10 MG
2156067 NIFEDIPINE CAP 10 MG
2156059 NIFEDIPINE CAP 5 MG
2229997 NIFEDIPINE CAPSULES 10 MG
2211092 NIFEDIPINE PA SRT 10 MG
2154390 NIFEDIPINE PA -10 SRT 10 MG
2154404 NIFEDIPINE PA 20 SRT 20 MG
2211106 NIFEDIPINE PA-20 - SRT 20 MG
782750 NIFEDIPINE-10 CAP 10 MG
336459 NIPRIDE INJ 50 MG
878936 NORVASC TAB 10 MG
878928 NORVASC TAB 5 MG
1937219 NOVAMILOR TAB 50/5 MG
2204517 NOVO-ACEBUTOLOL - TAB 100 MG
2204525 NOVO-ACEBUTOLOL - TAB 200 MG
2204533 NOVO-ACEBUTOLOL - TAB 400 MG
1912054 NOVO-ATENOL TAB 100 MG
1912062 NOVO-ATENOL TAB 50 MG
1942999 NOVO-CAPTORIL TAB 100 MG
1942964 NOVO-CAPTORIL TAB 12.5 MG
1942972 NOVO-CAPTORIL TAB 25 MG
1942980 NOVO-CAPTORIL TAB 50 MG
2046121 NOVO-CLONIDINE TABLETS 0.1 MG
2046148 NOVO-CLONIDINE TABLETS 0.2 MG
862924 NOVO-DILTAZEM TAB 30 MG
862932 NOVO-DILTAZEM TAB 60 MG
2229408 NOVO-DILTIAZEM SR 120 MG
2229406 NOVO-DILTIAZEM SRC 60 MG
2229407 NOVO-DILTIAZEM SRC 90 MG
363642 NOVO-DOPARIL 15 TAB 250/15 MG
363634 NOVO-DOPARIL 25 TAB 250/25 MG
21474 NOVO-HYDRAZIDE TAB 25 MG
21482 NOVO-HYDRAZIDE TAB 50 MG
759465 NOVO-HYLAZIN TAB 10 MG
759473 NOVO-HYLAZIN TAB 25 MG
759481 NOVO-HYLAZIN TAB 50 MG
337463 NOVO-MEDOPA TAB 125 MG
337471 NOVO-MEDOPA TAB 250 MG
337498 NOVO-MEDOPA TAB 500 MG
648043 NOVO-METOPROL TAB 100 MG
842656 NOVO-METOPROL TAB 100 MG (WHITE)
648035 NOVO-METOPROL TAB 50 MG
842648 NOVO-METOPROL TAB 50 MG (WHITE)
2126753 NOVO-NADOLOL TAB 40 MG
2126761 NOVO-NADOLOL TAB 80 MG
756830 NOVO-NIFEDIN CAP 10 MG
2047462 NOVO-NIFEDIN CAP 5 MG
869015 NOVO-PINDOL TAB 10 MG
869023 NOVO-PINDOL TAB 15 MG
869007 NOVO-PINDOL TAB 5 MG
496480 NOVO-PRANOL TAB 10 MG
549657 NOVO-PRANOL TAB 120 MG
740675 NOVO-PRANOL TAB 20 MG
496499 NOVO-PRANOL TAB 40 MG
496502 NOVO-PRANOL TAB 80 MG
1934198 NOVO-PRAZIN TAB 1 MG
1934201 NOVO-PRAZIN TAB 2 MG
1934228 NOVO-PRAZIN TAB 5 MG
21784 NOVO-RESERPINE TAB 0.25 MG
765953 NOVO-SEMIDE TAB 80 MG
337730 NOVO-SEMIDE TAB 20 MG
337749 NOVO-SEMIDE TAB 40MG
613223 NOVO-SPIROTON TAB 100 MG
613215 NOVO-SPIROTON TAB 25 MG
613231 NOVO-SPIROZINE TAB 25/25 MG
657182 NOVO-SPIROZINE TAB 50/50 MG
337455 NOVO-THALIDONE TAB 100 MG
337447 NOVO-THALIDONE TAB 50 MG
1947818 NOVO-TIMOL TAB 10 MG
1947826 NOVO-TIMOL TAB 20 MG
1947796 NOVO-TIMOL TAB 5 MG
532657 NOVO-TRIAMZIDE 25/50 MG
2211920 NOVO-VERAMIL SR SRT 240 MG
812358 NOVO-VERAMIL TAB 120MG
812331 NOVO-VERAMIL TAB 80 MG
2165546 NU-ACEBUTOLOL - TAB 100 MG
2165554 NU-ACEBUTOLOL - TAB 200 MG
2165562 NU-ACEBUTOLOL - TAB 400 MG
886106 NU-AMILZIDE TAB 50/5 MG
886122 NU-ATENOL TAB 100 MG
886114 NU-ATENOL TAB 50 MG
1913859 NU-CAPTO TAB 100 MG

1913824 NU-CAPTO TAB 12.5 MG
1913832 NU-CAPTO TAB 25 MG
1913840 NU-CAPTO TAB 50 MG
1913786 NU-CLONIDINE TAB 0.1 MG
1913220 NU-CLONIDINE TAB 0.2 MG
886068 NU-DILTIAZ TAB 30 MG
886076 NU-DILTIAZ TAB 60 MG
1913204 NU-HYDRAL TAB 10 MG
2004828 NU-HYDRAL TAB 25 MG
2004836 NU-HYDRAL TAB 50 MG
717517 NU-MEDOPA TAB 125 MG
717509 NU-MEDOPA TAB 250 MG
717576 NU-MEDOPA TAB 500 MG
865613 NU-METOP TAB 100 MG
865605 NU-METOP TAB 50 MG
865591 NU-NIFED CAP 10 MG
2212102 NU-NIFEDIPINE-PA SRT 10 MG
2200937 NU-NIFEDIPINE-PA TAB - 20 MG
886009 NU-PINDOL TAB 10 MG
886130 NU-PINDOL TAB 15 MG
886149 NU-PINDOL TAB 5 MG
1913794 NU-PRAZO TAB 1 MG
1913808 NU-PRAZO TAB 2 MG
1913816 NU-PRAZO TAB 5 MG
2044684 NU-PROPRANOLOL TAB 10 MG
2044722 NU-PROPRANOLOL TAB 120 MG
2044692 NU-PROPRANOLOL TAB 20 MG
2044706 NU-PROPRANOLOL TAB 40 MG
2044714 NU-PROPRANOLOL TAB 80 MG
2163772 NU-SOTALAL TAB 160 MG
2200996 NU-SOTALOL TAB 80 MG
2044617 NU-TIMOLOL TAB 10 MG
2044625 NU-TIMOLOL TAB 20 MG
2044609 NU-TIMOLOL TAB 5 MG
865532 NU-TRIAZIDE TAB 25/50 MG
886041 NU-VERAP TAB 120MG
886033 NU-VERAP TAB 80 MG
828424 PINDOLOL-10 TAB 10 MG
828432 PINDOLOL-15 TAB 15 MG
828416 PINDOLOL-5 TAB 5 MG
851787 PLENDIL SRT 10 MG
2057778 PLENDIL SRT 2.5 MG
851779 PLENDIL SRT 5 MG
584967 PMS-DOPAZIDE 15 TAB 250/15 MG
584975 PMS-DOPAZIDE-25 TAB 250/25 MG
2145421 PMS-METOPROLOL-B TAB 100 MG
2145413 PMS-METOPROLOL-B TAB 50 MG
1907158 PRAZOSIN-1 TAB 1 MG
1910302 PRAZOSIN-2 TAB 2 MG
1910310 PRAZOSIN-5 TAB 5 MG
839396 PRINIVIL TAB 10 MG
839418 PRINIVIL TAB 20 MG
839388 PRINIVIL TAB 5 MG
2108194 PRINZIDE TAB 10/12.5 MG
884413 PRINZIDE TAB 20/12.5 MG
884421 PRINZIDE TAB 20/25 MG
582255 PROPRANOL TAB 10 MG
582298 PROPRANOL TAB 120 MG
582263 PROPRANOL TAB 40 MG
582271 PROPRANOL TAB 80 MG
523402 PROPRANOLOL HCL TAB 10 MG
523399 PROPRANOLOL HCL TAB 40 MG
523380 PROPRANOLOL HCL TAB 80 MG
512575 PROPRANOLOL TAB 10MG
512532 PROPRANOLOL TAB 40 MG
512540 PROPRANOLOL TAB 80 MG
667064 PROPRANOLOL-120 TAB 120 MG
667072 PROPRANOLOL-20 TAB 20 MG
519367 PRO-TRIAZIDE TAB 25/50 MG
184519 RAUTRACTYL 2 MG
184527 RAUTRACTYL 4 MG
864021 RENEDIL SRT 10 mg
1989596 RENEDIL SRT 10 MG
2221985 RENEDIL SRT 2.5 MG
2069539 RENEDIL SRT 2.5 MG
2057786 RENEDIL SRT 2.5 MG
864013 RENEDIL SRT 5 MG
2221993 RENEDIL SRT 5 MG
1989618 RENEDIL SRT 5 MG
93211 RESERPINE TAB 0.1 MG
93238 RESERPINE TAB 0.25 MG
513040 RESERPINE TAB 0.25 MG
2144239 RHO-PRAZOSIN TAB 1 MG
2144247 RHO-PRAZOSIN TAB 2 MG
2144255 RHO-PRAZOSIN TAB 5 MG
1910140 RHOTRAL 100 TAB 100 MG
1910159 RHOTRAL 200 TAB 200 MG
1910167 RHOTRAL 400 TAB 400 MG
2220687 SCHEINPHARM ATENOLOL TAB 100 MG
2220679 SCHEINPHARM ATENOLOL TAB 50 MG
1926543 SECTRAL 100 TAB 100 MG
1926551 SECTRAL 200 TAB 200 MG
771333 SECTRAL 400 TAB 400 MG
1926578 SECTRAL 400 TAB 400 MG
726559 SECTRAL TAB 100 MG
726567 SECTRAL TAB 200 MG
74608 SER-AP-ES TAB 0.1/15/25 MG
5665 SERPASIL 0.25 MG
74373 SERPASIL ESIDRIX-25 0.1/25 MG
74381 SERPASIL ESIDRIX-50 0.2/50 MG

5657 SERPASIL TAB 0.1 MG
704660 SINCOMEN TAB 25 MG
534587 SLOW TRASICOR TAB 160 MG
534579 SLOW TRASICOR TAB 80 MG
483923 SOTACOR TAB 160 MG
897280 SOTACOR TAB 240 MG
897272 SOTACOR TAB 80 MG
2222027 SOTALOL-160 TAB 160 MG
2222019 SOTALOL-80 TAB 80 MG
231169 SUPRES 150 TAB 250/150 MG
231177 SUPRES 250 TAB 250/250 MG
818593 SYN-PINDOLOL TAB 10 MG
818607 SYN-PINDOLOL TAB 15 MG
818615 SYN-PINDOLOL TAB 5 MG
2028522 TARO-ATENOLOL TAB 100 MG
2028514 TARO-ATENOLOL TAB 50 MG
2028530 TARO-DILTIAZEM TAB 30 MG
2028549 TARO-DILTIAZEM TAB 60 MG
2028638 TARO-NIFEDIPINE CAP 10 MG
2028611 TARO-VERAPAMIL TAB 120MG
2028603 TARO-VERAPAMIL TAB 80 MG
2171805 TENOLIN TAB 100 MG
2171791 TENOLIN TAB 50 MG
2049988 TENORETIC 100/25MG TAB
2049961 TENORETIC 50/25MG TAB
638633 TENORETIC TAB 100/25 MG
638625 TENORETIC TAB 50/25 MG
486833 TENORMIN TAB 100 MG
2039540 TENORMIN TAB 100 MG
520683 TENORMIN TAB 50 MG
2039532 TENORMIN TAB 50MG
509353 TIMOLIDE TAB 10/25 MG
812447 TIMOLOL-10 TAB 10 MG
812439 TIMOLOL-20 TAB 20 MG
812455 TIMOLOL-5 TAB 5 MG
2091518 TRANDATE 5 MG/ML LIQ
1924923 TRANDATE INJ 5 MG/ML
2106272 TRANDATE TAB 100 MG
1924915 TRANDATE TAB 100 MG
603651 TRANDATE TAB 100MG
2106280 TRANDATE TAB 200 MG
1924931 TRANDATE TAB 200 MG
603643 TRANDATE TAB 200MG
402567 TRASICOR TAB 20 MG
402575 TRASICOR TAB 40 MG
402583 TRASICOR TAB 80 MG
1910191 TRIAMTERENE & HCTZ 25/50 MG
293881 URIDON TAB 100 MG
298964 URIDON TAB 50 MG
344079 URITOL TAB 40 MG
405620 UROZIDE TAB 100 MG
263893 UROZIDE TAB 25 MG
263907 UROZIDE TAB 50 MG
657298 VASERETIC TAB 10/25 MG
670901 VASOTEC TAB 10 MG
851795 VASOTEC TAB 2.5 MG
670928 VASOTEC TAB 20 MG
708879 VASOTEC TAB 5 MG
1919695 VERAPAMIL INJ 2.5 MG/ML
871028 VERAPAMIL TAB 80 MG
871036 VERAPAMIL-120 TAB 120 MG
2100479 VERELAN SRC 120MG
2100487 VERELAN SRC 180 MG
2100495 VERELAN SRC 240 MG
568627 VISKAZIDE 10/25 TAB 10/25 MG
568635 VISKAZIDE 10/50 TAB 10/50 MG
443174 VISKEN TAB 10 MG
417289 VISKEN TAB 15 MG
417270 VISKEN TAB 5 MG
888427 ZAROXOLYN TAB 10 MG
301671 ZAROXOLYN TAB 10 MG
888400 ZAROXOLYN TAB 2.5 MG
301663 ZAROXOLYN TAB 2.5 MG
888419 ZAROXOLYN TAB 5 MG
301698 ZAROXOLYN TAB 5 MG
2045737 ZESTORETIC TAB 20/12.5 MG
2045729 ZESTORETIC TAB 20/25 MG
2103729 ZESTORETIC TAB 10/12.5 MG
884375 ZESTORETIC TAB 20/12.5 MG
884383 ZESTORETIC TAB 20/25 MG
839329 ZESTRIL TAB 10 MG
2049376 ZESTRIL TAB 10 MG
839337 ZESTRIL TAB 20 MG
2049384 ZESTRIL TAB 20 MG
2049333 ZESTRIL TAB 5 MG
839442 ZESTRIL TAB 5 MG

Appendix IV: Age and Sex Distribution of Seniors with Diabetes[1] and ≥ 1 Antihypertensive Drug Claim per Fiscal Year, Nova Scotia Seniors' Pharmacare, 1989 to 1995.[2]

Fiscal Year	Age Group	Males (M)			Females (F)			Total Diabetics[3]		
	Years (y)	N	% of Total Diabetics	% of Total Diabetics ≥75y	N	% of Total Diabetics	% of Total Diabetics ≥75y	N	%	% ≥75y
1989	65 - 69	1,128	11.3%		1,455	14.5%				
	70 - 74	1,180	11.8%		1,595	15.9%				
	75 - 79	931	9.3%		1,390	13.9%				
	80 - 84	478	4.8%		922	9.2%				
	85+	266	2.7%		672	6.7%				
	Total	3,983	39.8%	16.7%	6,034	60.2%	29.8%	10,017	100%	46.5%
1990	65 - 69	1,140	11.1%		1,440	14.1%				
	70 - 74	1,203	11.8%		1,632	15.9%				
	75 - 79	955	9.3%		1,441	14.1%				
	80 - 84	547	5.3%		924	9.0%				
	85+	247	2.4%		705	6.9%				
	Total	4,092	40.0%	17.1%	6,142	60.0%	30.0%	10,234	100%	47.1%
1991	65 - 69	1,140	10.8%		1,419	13.4%				
	70 - 74	1,242	11.8%		1,666	15.8%				
	75 - 79	1,034	9.8%		1,515	14.3%				
	80 - 84	598	5.7%		936	8.9%				
	85+	278	2.6%		731	6.9%				
	Total[4]	4,292	40.6%	18.1%	6,267	59.4%	30.1%	10,558	100%	48.2%
1992	65 - 69	1,184	10.8%		1,415	12.9%				
	70 - 74	1,313	12.0%		1,742	15.9%				
	75 - 79	1,030	9.4%		1,530	14.0%				
	80 - 84	660	6.0%		1,026	9.4%				
	85+	322	2.9%		745	6.8%				
	Total	4,509	41.1%	18.3%	6,458	58.9%	30.1%	10,967	100%	48.4%

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1 Seniors are identified by an administrative definition for pharmacologically or nonpharmacologically treated diabetes (i.e. at least one ICD-9 250 physician or hospital claim or at least one antidiabetic drug claim in the fiscal year) and have at least one claim for an antihypertensive drug in the specified fiscal year.
2 The selected drugs include the therapeutic groups C02, C03, C07, C08, and C09 of the 1997 World Health Organization Anatomical Therapeutic Chemical Index and may be used for the treatment of hypertension. The reason for treatment with antihypertensive drugs was unknown.
3 Persons were counted once per fiscal year. Sum of total persons per year is greater than total persons per seven year study period due to multiple count of individuals appearing in more than one year.
4 One person was identified as both male and female on separate drug claims during the fiscal year.

Appendix IV continued...

Fiscal Year	Age Group Years (y)	Males (M)			Females (F)			Total Diabetics		
		N	% of Total Diabetics	% of Total Diabetics ≥75y	N	% of Total Diabetics	% of Total Diabetics ≥75y	N	%	% ≥75y
1993	65 - 69	1,218	10.7%		1,470	12.9%				
	70 - 74	1,346	11.8%		1,778	15.6%				
	75 - 79	1,077	9.5%		1,604	14.1%				
	80 - 84	74	5.9%		1,086	9.5%				
	85+	24	2.8%		810	7.1%				
	Total	4,639	40.7%	18.2%	6,748	59.3%	30.7%	11,387	100%	49.0%
1994	65 - 69	1,231	11.1%		1,568	14.1%				
	70 - 74	1,094	9.8%		1,794	16.1%				
	75 - 79	17	7.3%		1,650	14.8%				
	80 - 84	618	5.6%		1,190	10.7%				
	85+	306	2.8%		850	7.6%				
	Total	4,066	36.6%	15.7%	7,052	63.4%	33.2%	11,118	100%	48.8%
1995	65 - 69	1,399	12.0%		1,578	13.5%				
	70 - 74	1,153	9.9%		1,821	15.6%				
	75 - 79	879	7.5%		1,768	15.1%				
	80 - 84	635	5.4%		1,242	10.6%				
	85+	321	2.7%		901	7.7%				
	Total[4]	4,387	37.5%	15.7%	7,310	62.5%	33.4%	11,696	100%	49.1%
Total		9,569			12,882			22,451		

Appendix V: Nova Scotia Seniors' Pharmacare Program.

Schedule of Copayments, Premiums, and Insurance of Veterans/Status Indians.[74,75,95-99]

Fiscal Years	Guaranteed Income Supplement Seniors (GIS)	Non-Guaranteed Income Supplement Seniors (NonGIS)
1974-1990	**Copayment:** $0.00	**Copayment:** $0.00
1990	**June 1, 1990: Maximum Allowable Cost program is introduced.**	
1990-1991	**Copayment**[1]: $3 /prescription **Maximum Copayment:** $150 annually	**Copayment:** $3 /prescription **Maximum Copayment:** $150 annually
1991-1992	**Copayment**[2]: 20 % /prescription (minimum $3) **Maximum Copayment:** $150 annually	**Copayment:** 20 % /prescription (minimum $3) **Maximum Copayment:** $150 annually
1992-1995	**Copayment**[3]: 20% /prescription (minimum $3) **Maximum Copayment:** $150 annually	**Copayment:** 20% /prescription (minimum $3) **Maximum Copayment:** $400 annually
1993	**October 1, 1993: Province becomes insurer of last resort for Veterans and Status Indians.**	
1995-1996	**Premium**[4]: $215 due on April 1st, persons may receive up to $300 rebate with qualifying income. Low income married seniors: $15,000 - $21,000 household income, full credit received < $18 000) Low income single seniors: $15,000 - $18,000; full credit received < $15 000 **Copayment:** 20% /prescription (minimum $3) **Maximum Copayment**[5]: $200 annually **Total maximum annual out-of-pocket costs:** *based on income*	**Premium:** $215 due on April 1st **Copayment:** 20% /prescription (minimum $3) **Maximum Copayment:** $200 annually **Total maximum annual out-of-pocket costs** : $415

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1 Copayment introduced June 1,1990.

2 Copayment increased July 1, 1991.

3 Maximum annual copayment increased Jan 1, 1993.

4 Premium: Late entry fee April 1, 1996: $430.00 for one year with a 90 day waiting period, and normal premium in subsequent years.

5 Maximum annual copayment increased April 1, 1995. Copayment year ends March 31, 1996.

Fiscal Years	Guaranteed Income Supplement Seniors (GIS)	Non-Guaranteed Income Supplement Seniors (NonGIS)
1996 - 1997	**Premium**[6]: $215 due on April 1st, persons may receive up to $300 rebate with qualifying income. Low income married seniors: $18,000 -$24,000 household income, full credit received < $18 000) Low income single seniors: $15,000 - $18,000; full credit received < $15,000 **Copayment:** 20% /prescription (minimum $3) **Maximum Copayment:** $200 annually **Total maximum annual out-of-pocket costs**: *< $415, based on income*	**Premium:** $215 due on April 1st **Copayment:** 20% /prescription (minimum $3) **Maximum Copayment:** $200 annually **Total maximum annual out-of-pocket costs:** $415

6 Premium: Late entry (entry greater than 3 months after turning 65 years of age) fee April 1, 1997: $430.00 for one year and 1.5 times the annual premium in subsequent years. Waiting period for coverage is 90 days.

Appendix VI: Proportion of Diabetic and Nova Scotia Seniors' Pharmacare Beneficiaries Aged 75 Years and Over (≥ 75 y).

Fiscal Year[1]	Pharmacare Beneficiaries[2] (≥ 1 Pharmacare Drug Claim)			Diabetics[3] with ≥1 Antihypertensive[4] Drug Claim		
	Total	N ≥ 75 y	% ≥ 75 y	Total	N ≥ 75 y	% ≥ 75 y
1989/90	105,079	45,429	43.2	10,017	4,659	46.5
1990/91	106,022	46,715	44.1	10,234	4,819	47.1
1991/92	106,863	47,841	44.8	10,559	5,092	48.2
1992/93	108,058	49,056	45.4	10,967	5,313	48.4
1993/94	109,215	50,628	46.4	11,387	5,575	49.0
1994/95	102,439	48,123	47.0	11,118	5,431	48.8
1995/96	103,306	49,247	47.7	11,696	5,746	49.1

1 Fiscal Year is April 1 to March 31.
2 All seniors with at least one Pharmacare claim of any type in a fiscal year.
3 Seniors are identified by an administrative definition for pharmacologically or nonpharmacologically treated diabetes (i.e. at least one ICD-9 250 physician or hospital claim or at least one antidiabetic drug claim in the fiscal year) and have at least one claim for an antihypertensive drug in the specified fiscal year.
4 The selected drugs include the therapeutic groups C02, C03, C07, C08, and C09 of the 1997 World Health Organization Anatomical Therapeutic Chemical Index and may be used for the treatment of hypertension. The reason for treatment with antihypertensive drugs was unknown.

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