

## Drug prescribing for the elderly in Saskatchewan during 1976

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Over 11% of Saskatchewan's population is 65 years of age or older. To study patterns of prescribing for the elderly a computer file of more than 3.6 million prescriptions filled in Saskatchewan in 1976 was reviewed. The elderly population (aged 65 years or more) that year was 102 070, and 77.3% received at least one prescription drug listed in the Saskatchewan Formulary. In comparison with a "middle-aged" group (persons between the ages of 35 and 54 years) the elderly showed moderately higher average numbers of prescriptions filled and drugs used per person that year. However, the prescription of antihypertensive agents and diuretics increased dramatically with age, and barbiturates, in view of their potential toxicity, appeared to be over-prescribed for the elderly.

Plus de 11% de la population de la Saskatchewan est âgée de 65 ans ou plus. Afin d'étudier le profil de prescription chez les gens âgés on a enregistré sur ordinateur de plus de 3.6 millions de prescriptions remplies en Saskatchewan en 1976 a été passé en revue. La population âgée (de 65 ans ou plus) cette année-là était de 102 070, et 77.3% d'entre eux reçurent au moins un des produits d'ordonnance inscrits au formulaire de la Saskatchewan. En comparaison avec un groupe d'âge moyen (des personnes dont l'âge était compris entre 35 et 54 ans) les personnes âgées ont présenté un nombre modérément plus élevé de prescriptions remplies et de médicaments utilisés par personne cette année-là. Cependant, les prescriptions d'antihypertenseurs et de diurétiques augmentaient sensiblement avec l'âge, et les barbituriques, compte tenu de leur toxicité potentielle, semblèrent être surprescrits chez les gens âgés.

According to the United Nations definition<sup>1</sup> Canada achieved the status of an aged nation in 1945,<sup>2</sup> when more than 7% of the population exceeded the age of 65 years. The province of Saskatchewan reached this

percentage 3 years later.<sup>3</sup> Since that time Saskatchewan has surpassed the Canadian average, and as of June 1, 1977 it had the highest percentage of elderly people of any province in the country.<sup>4</sup>

The rising number of elderly people in Saskatchewan has had a particularly profound effect on the health and social services of the province. For example, the use of medical and hospital services has risen steadily.<sup>5</sup> As might be expected too, a disproportionately high rate of prescription drug use is seen in the elderly.<sup>6</sup> The study described in this paper was undertaken to review patterns of drug prescribing for the elderly. Specifically it sought:

- To determine the general level of drug prescribing for the elderly, compared with the "middle-aged".
- To determine which drugs are prescribed particularly for the elderly and for subgroups within that broad category.
- To examine these drug prescription patterns in the light of current knowledge of the pharmacologic properties of the drugs.
- To heighten professional and public awareness and concerns about both the benefits and the potential hazards of drug therapy for the elderly.

### Methods

In September 1975 the Saskatchewan Prescription Drug Plan began providing benefits. It is a universal provincial health program that in June 1976 covered an eligible population of 909 714. For drugs listed in the Saskatchewan Formulary and classified as benefits the plan pays the cost of drug materials and a portion of the dispensing fee. The formulary does not list all the drugs available on the Canadian market but included 445 generic drugs in 1976. Products must qualify for inclusion in the formulary on the basis of demonstrated therapeutic effectiveness. Drugs not listed in the formulary may be prescribed by physicians; however, the patients are required to assume the total financial responsibility for these products. Drugs given

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in hospital that are covered as benefits under other health service programs are not included in the Saskatchewan Prescription Drug Plan. In spite of the fact that the restricted formulary does not include all the products on the Canadian market, the products listed in the formulary represent 85% to 90% of the prescribed drugs dispensed at retail pharmacies in Saskatchewan (S. Petz, executive director, Saskatchewan Prescription Drug Plan: personal communication, 1978).

The Saskatchewan Prescription Drug Plan's prescription claims are processed by a computer assessment system, with permanent records maintained on magnetic tape. The computerized record of payment served as the data base for this study. The full data file used in the study, including records of all benefit drugs dispensed to all beneficiaries, contained 3 665 481 prescription records for the calendar year 1976. Statistical handling of the records was accomplished by a series of COBOL-language computer programs, most of which were written specifically for the study.\*

Two age groups were established for the purposes of this study: the elderly, defined as persons 65 years of age or older, and the middle-aged, defined as persons 35 to 54 years old. The elderly group was broken down into three subgroups — 65 to 74 years, 75 to 84 years and 85 years and over — so that drug prescription trends with increasing age could be observed.

The analysis was carried out in two stages. In the first stage all drugs listed in the Saskatchewan Formulary were reviewed and their use by age was recorded. Because of the volume of information provided in this stage it was impossible to pursue in detail the use of all drugs by the various age groups. Instead it was decided to study in detail in the second stage the use of cardiovascular drugs, central nervous system drugs and diuretics. To simplify further the handling of

\*Further details may be obtained by writing to: Mr. S. Petz, Executive director, Saskatchewan Prescription Drug Plan, 3475 Albert St., Regina, Sask. S4S 6X6.

the data, only some drugs within each class were analysed. For example, within the cardiovascular class hypotensive agents were studied but cardiac and anti-lipemic drugs were not. Within the central nervous system class psychotherapeutic agents and sedatives were studied; analgesics, anti-inflammatory agents and anticonvulsants were not researched further. The final group studied in detail were the important diuretics. Together these groups contained 66 active ingredients and were judged to be of particular interest to the study as they represented areas of high use by patients. For each active ingredient group a profile was produced that indicated use by age group, numbers of users, total and average numbers of prescriptions and prescription quantities, and rates of use per 1000 population. These profiles formed the basis of the main part of this paper and provided the information for much of the discussion.

## Results

The use of all drugs listed in the Saskatchewan Formulary for the age groups studied is presented in Table I. Although not indicated in the table, persons 65 years of age or older, who accounted for 11% of the population, received 28% of the prescriptions. There is also evidence of increasing use of prescription drugs with advancing age. Compared with the middle-aged group, patients between 65 and 74 years of age received 1.72 times as many prescriptions, those from 75 to 84 years 2.10 times and those 85 years or older 2.42 times. Similarly the average number of drugs obtained per person increased step-wise with advancing age.

Table II displays the number of prescriptions filled per 1000 population by age group and drug class. The patterns described for total drug use in the various age groups are also apparent in the main for each drug class. The information in this table could serve as the basis for a detailed look at several of the drug classes. However, as explained earlier, for the purposes of this study only some of the drugs classified as cardio-

Table I—Use of all prescription drugs, by age group, Saskatchewan, 1976\*†

Variable	Age group (yr)		Elderly subgroup (yr)		
	35-54	65+	65-74	75-84	85+
Population as of June 30, 1976‡	184 854	102 070	60 632	30 820	10 618
Active beneficiaries, 1976§					
No.	118 738	78 900	44 958	24 851	9 091
% of population	64.2	77.3	74.1	80.6	85.6
Prescriptions					
Total no.	792 557	1 009 699	514 437	348 418	146 844
No. per active beneficiary	6.67	12.80	11.44	14.02	16.15
Ratio elderly/middle-aged		1.92	1.72	2.10	2.42
Drugs					
Average no. per person¶	2.96	4.05	3.81	4.31	4.49
Ratio elderly/middle-aged		1.37	1.29	1.46	1.52

\*All four tables have been reduced in complexity for easy reading. Persons interested in obtaining the detailed information on which the drug classifications and survey were based should write to Dr. Johnson at the reprint requests address.

†Each individual's age was calculated as at June 30, 1976 ( $\pm 1$  month). All prescriptions for any individual were considered to have been received at this age.

‡Source: Saskatchewan Hospital Services Plan.

§Person who received a Saskatchewan Formulary prescription drug during the study year.

¶A "drug", for the purpose of calculating this statistic, is an active ingredient group as defined in the Saskatchewan Formulary.

vascular agents, central nervous system drugs or diuretics were investigated in detail.

*Hypotensive drugs and diuretics*

Table III describes the use of some of the more commonly prescribed antihypertensive products and diuretics. As the table shows, elderly people were more likely to receive these drugs. However, for most of the products listed the average number of prescriptions filled in 1976 for each elderly patient treated with

that medication did not differ markedly from the average number in the middle-aged group.

In addition to the drugs listed in Table III two combination products used for the treatment of hypertension, methyldopa-hydrochlorothiazide and reserpine-hydralazine-hydrochlorothiazide, were also dispensed more often for the elderly than for the middle-aged, at rates comparable to those of each of their ingredients. For every 1000 elderly individuals 240 prescriptions were filled for methyldopa-hydrochloro-

Table II—Number of prescriptions filled per 1000 population,\* by age group and drug class, Saskatchewan, 1976

Drug class†	Age group (yr)		Elderly subgroup (yr)		
	35-54	65+	65-74	75-84	85+
Anti-infective	745	904 (1.2)	808 (1.1)	962 (1.3)	1289 (1.7)
Autonomic	147	321 (2.2)	311 (2.1)	335 (2.3)	336 (2.3)
Cardiovascular	339	1925 (5.7)	1692 (5.0)	2237 (6.6)	2353 (6.9)
Central nervous system	1514	2946 (1.9)	2569 (1.7)	3333 (2.2)	3978 (2.6)
Diuretic	220	1409 (6.4)	989 (4.5)	1766 (8.0)	2773 (12.6)
Hormones and substitutes	641	855 (1.3)	845 (1.3)	901 (1.4)	784 (1.2)
Skin and mucous membrane	227	326 (1.4)	285 (1.3)	367 (1.6)	442 (1.9)

\*Elderly/middle-aged ratios are given in parenthesis.

†Those not shown include antihistamines, blood control drugs, cough preparations, eye, ear, nose and throat preparations, gastrointestinal drugs, spasmolytics, vitamins and others.

Table III—Number of prescriptions filled for hypotensive drugs and diuretics per 1000 population\* and per patient,† by age group, Saskatchewan, 1976

Active ingredient group‡	Age group (yr)		Elderly subgroup (yr)			
	35-54	65+	65-74	75-84	85+	
Hydrochlorothiazide	Per 1000 population	75	329 (4.4)	275 (3.7)	376 (5.0)	499 (6.7)
	Per patient	3.5	4.4	4.4	4.3	5.0
Methyldopa	Per 1000 population	56	233 (4.2)	244 (4.4)	238 (4.3)	160 (2.9)
	Per patient	5.1	5.5	5.6	5.3	5.4
Reserpine	Per 1000 population	5	48 (9.6)	42 (8.4)	59 (11.8)	58 (11.6)
	Per patient	4.2	5.0	4.8	5.1	5.6
Furosemide	Per 1000 population	63	524 (8.3)	302 (4.8)	705 (11.2)	1269 (20.1)
	Per patient	3.0	4.5	3.9	4.6	5.3
Triamterene-hydrochlorothiazide	Per 1000 population	59	297 (5.0)	244 (4.1)	345 (5.8)	461 (7.8)
	Per patient	3.6	4.4	4.4	4.4	4.8
Spironolactone	Per 1000 population	8	61 (7.6)	40 (5.0)	79 (9.9)	132 (16.5)
	Per patient	4.1	4.5	4.5	4.4	4.9

\*Elderly/middle-aged ratios are given in parenthesis.

†Average number of prescriptions filled in 1976 for each patient treated with the medication.

‡Those not shown include methyldopa-hydrochlorothiazide, reserpine-hydralazine-hydrochlorothiazide, methyldopa-chlorothiazide, chlorthalidone, clonidine hydrochloride, guanethidine sulfate, hydralazine, chlorthalidone-reserpine, rauwolfia serpentina, debrisoquine sulfate, bethanidine sulfate, pargyline hydrochloride, acetazolamide, triamterene, ethacrynic acid and mercaptopimerin sodium.

thiazide, whereas for every 1000 middle-aged individuals 53 such prescriptions were filled (a 4.5-fold difference); the corresponding figures for reserpine-hydralazine-hydrochlorothiazide were 91 and 12 prescriptions (a 7.6-fold difference).

Both furosemide and hydrochlorothiazide were prescribed often for middle-aged patients. However, the difference in the frequency with which furosemide was dispensed between the elderly and the middle-aged was much greater than that noted for hydrochlorothiazide.

Hydrochlorothiazide and chlorthalidone share many properties. Space limitations prevent us from describing the use of chlorthalidone; however, the difference between the elderly and the middle-aged in the frequency with which prescriptions for chlorthalidone were filled was similar to the difference for hydrochlorothiazide — 4.4-fold (175 v. 40 prescriptions).

#### Central nervous system drugs

The use of antidepressants, tranquilizers, sedatives and hypnotics was studied in detail. Amitriptyline, trimipramine and imipramine were the most commonly prescribed antidepressants. For every 1000 middle-aged residents of Saskatchewan 76 prescriptions were dispensed for amitriptyline; the figure increased 1.7 times, to 126, for the elderly. Similar increases were observed for trimipramine and imipramine; 35 prescriptions for trimipramine and 21 prescriptions for imipramine were filled per 1000 middle-aged individuals, and the corresponding numbers for the elderly were 47 and 34.

Table IV compares the use of selected tranquilizers, sedatives and hypnotics in the various age groups. Diazepam was the tranquilizer most frequently prescribed, accounting for 56% of all the tranquilizer prescriptions filled for the elderly. In spite of this, and contrary to popular belief, the difference in frequency of diazepam use in the elderly as compared with the middle-aged was not marked, perhaps because this drug was extensively used by the middle-aged. Only 9% of the prescriptions filled for tranquilizers were for chlordiazepoxide hydrochloride, and the use of the drug increased only slightly with age: the number of prescriptions per 1000 individuals increased 1.3-fold, from 72 in the middle-aged to 91 in the elderly. Thioridazine use was 5.1 times greater in the elderly.

Other drugs often prescribed were the phenothiazines chlorpromazine, prochlorperazine and trifluoperazine, and the butyrophenone haloperidol. For every 1000 middle-aged residents of Saskatchewan 65 prescriptions were filled for these four drugs, whereas for every 1000 elderly residents 151 such prescriptions were filled — a 3.6-fold difference. Of the four drugs, only trifluoperazine was not used more frequently by the elderly than by the middle-aged.

Among the sedatives and hypnotics phenobarbital and flurazepam were commonly prescribed for middle-aged individuals. Sedatives and hypnotics in general were prescribed more frequently for the elderly, but the use of phenobarbital in the age group 85 and over was disproportionately greater, compared with that of flurazepam. The trend seen with phenobarbital was also seen with secobarbital, pentobarbital sodium and amobarbital. Although not shown in Table IV, the total

Table IV—Number of prescriptions filled for tranquilizers, sedatives and hypnotics per 1000 population\* and per patient, † by age group, Saskatchewan, 1976

Active ingredient group ‡	Age group (yr)		Elderly subgroup (yr)		
	35-54	65+	65-74	75-84	85+
<b>Diazepam</b>					
Per 1000 population	444	563 (1.3)	593 (1.3)	558 (1.3)	464 (1.0)
Per patient	3.3	3.7	3.7	3.7	4.0
<b>Thioridazine hydrochloride</b>					
Per 1000 population	17	86 (5.1)	47 (2.8)	107 (6.3)	246 (14.5)
Per patient	5.1	5.3	6.1	5.9	6.6
<b>Phenobarbital</b>					
Per 1000 population	41	114 (2.8)	95 (2.3)	136 (3.3)	159 (3.9)
Per patient	4.0	4.0	3.9	4.0	4.5
<b>Flurazepam hydrochloride</b>					
Per 1000 population	48	113 (2.4)	105 (2.2)	129 (2.7)	119 (2.5)
Per patient	2.5	2.9	2.9	2.9	2.8
<b>Chloral hydrate</b>					
Per 1000 population	8	59 (7.4)	25 (3.1)	77 (9.6)	193 (24.1)
Per patient	2.6	3.8	3.1	4.0	4.4

\*Elderly/middle-aged ratios are given in parenthesis.

†Average number of prescriptions filled in 1976 for each patient treated with the medication.

‡Those not shown include chlordiazepoxide hydrochloride, oxazepam, chlorpromazine, trifluoperazine, prochlorperazine, haloperidol, promazine hydrochloride, meprobamate, hydroxyzine hydrochloride, perphenazine, chlorazepate, fluphenazine, pericyazine, mesoridazine besylate, chlorprothixene, pimozide, piperacetazine, secobarbital, pentobarbital sodium, amobarbital, butobarbital, levomepromazine, promethazine hydrochloride and paraldehyde.

number of prescriptions filled for these three drugs was 24 per 1000 middle-aged individuals but 108 per 1000 elderly individuals — a 4.5-fold difference. Thus, there is still widespread use of barbiturates for older people, and particularly those 85 years of age or older. Chloral hydrate was not prescribed extensively for the middle-aged but was prescribed extensively for the elderly, especially those 85 years of age or older, in whom the use of this drug exceeded that of flurazepam.

## Discussion

### *General level of drug prescribing for the elderly*

This study was the most comprehensive survey ever undertaken of drug prescribing for the elderly. Previous reports have dealt with a random sample of the population,<sup>7</sup> an institutional population of the elderly,<sup>8,9</sup> and a general practice survey.<sup>10</sup> Achong and colleagues<sup>11</sup> reported on drug use in the elderly, but their investigation was in a more restricted sample of the aged.

The Saskatchewan study was unique in several respects. First, it was the most comprehensive survey of its kind, representing the experience over a 12-month period of 102 070 patients over the age of 65, 77.3% of whom were beneficiaries of the Saskatchewan Prescription Drug Plan. Second, it surveyed prescription drug use in the community rather than in a hospital. Almost all prescription drugs other than those administered to hospital inpatients were included in this study; as a result, the prescribing of most of the prescription drugs issued to the elderly was reviewed.

The review of drug use in the elderly as reported in Tables I and II provided interesting and perhaps surprising observations. Compared with the rate for the middle-aged, the rate of drug prescribing for the elderly was lower than one might have expected from the literature.<sup>12-14</sup> For example, during 1976, 77.3% of the people 65 years of age or older received one or more prescriptions, compared with 64.2% of those aged 35 to 54 years. When one considers the greater likelihood of illness and multiple disorders, especially of the cardiovascular system, with advancing age, the higher rate of drug use in the elderly does not appear to be excessive. The greater likelihood of chronic continuing illness with advancing years is consistent with the increase in the prescription rate observed. It is our feeling that the approximately twofold greater number of prescriptions written for the elderly as compared with the middle-aged is not unexpected.

There is evidence, however (from the 1975-76 statistical tables of the medical services division, Saskatchewan Department of Health), that the number of prescriptions per person per year calculated for the elderly people in this study, 12.80, was an underestimate, as was the average number of drugs received per elderly person. Older patients in nursing homes or in the community often receive prescriptions for diverse drugs, such as laxatives, vitamins, sedatives, hypnotics and peripheral vasodilators, that are not included in the Saskatchewan Formulary. Sedatives and hypnotics containing methaqualone, glutethimide, methypylon and ethchlorvynol were not included in the formulary, nor were laxatives and vitamins, which were cheaper to buy as over-the-counter drugs than through the

Saskatchewan Prescription Drug Plan. Unfortunately it was impossible to determine the number of drugs that may have been prescribed or purchased under these conditions.

### *Use of cardiovascular drugs and diuretics in the elderly*

Cardiovascular agents, central nervous system drugs and diuretics represented approximately two thirds of all the drugs prescribed for the elderly in our survey. Although the overprescribing of central nervous system depressants for the elderly is emphasized in the literature, this study showed that the greatest increase in the frequency of prescribing was for cardiovascular agents and diuretics. The dramatic increase noted for these drugs may reflect physicians' intention of controlling hypertension and related disorders.

Approximately 56% of all the cardiovascular drugs prescribed within the Saskatchewan Prescription Drug Plan for persons 65 years of age or older were for the treatment of hypertension. The most common hypotensive drugs and diuretics were furosemide, hydrochlorothiazide, triamterene-hydrochlorothiazide, methyldopa-hydrochlorothiazide and methyldopa. It is unfortunate that propranolol, which has recently been used extensively for the treatment of hypertension, was listed only as a cardiac drug in the Saskatchewan Formulary in 1976 and not as a hypotensive drug. As a result its use was not reviewed. It would have been most interesting to observe the rate at which it was prescribed for the elderly at that time.

A closer examination of the data suggests some interesting inconsistencies. Although more of the elderly than of the middle-aged were treated with hypotensive drugs and diuretics the number of prescriptions for each drug per patient in 1976 was between four and five for both age groups. This is difficult to explain. Each prescription must be renewed every 34 days. As the treatment of hypertension is continuous, one would expect that each patient would ideally require 11 or 12 prescriptions per year. The fact that the actual figure was considerably less may reflect poor patient compliance or the fact that antihypertensive therapy was started and discontinued in similar numbers of patients that year. If rational therapy is sought, neither possibility is acceptable. It is apparent that, although more of the elderly than of the middle-aged were receiving treatment for hypertension, there is no evidence, on the basis of the amounts of drugs dispensed, that they were being treated more effectively than their younger counterparts.

The treatment of hypertension in the elderly is a controversial issue. Several studies have suggested that symptomless hypertension in the elderly is not an indication for therapy.<sup>15-17</sup> It has been argued that enthusiastic antihypertensive regimens in persons with atheromatous and therefore less elastic blood vessels may result in a serious reduction in blood pressure and a critical decrease in cerebral blood flow, and may precipitate hemiplegia.<sup>18</sup> Judge and Caird<sup>19</sup> advised that high blood pressure should only be treated when it remains high after the resolution of cardiac failure or when it is accompanied by undoubted signs of cardiac damage.

These views have not been shared by all workers. Chrysant, Frohlich and Papper<sup>20</sup> have maintained that, regardless of the patient's age, a systolic blood pressure above 160 mm Hg and a diastolic blood pressure above 95 mm Hg should be treated. Alderman, Rodman and Seligman,<sup>21</sup> quoting from the Framingham study, indicated that symptom-free persons with hypertension were four times as likely to have an atherothrombotic brain infarction as controls, regardless of age.

It is not the purpose of this discussion to review all the pros and cons of the treatment of hypertension in the elderly. Suffice it to say that disagreement exists as to its necessity. Antihypertensive drugs are not without their side effects. Postural hypotension is common in the elderly, largely because of an impaired baroreceptor response<sup>22</sup> and a reduction in peripheral venous tone.<sup>23</sup> These factors complicate the use of antihypertensive medication as well as diuretics in elderly patients since the dose must be titrated even more cautiously than in younger patients to avoid severe orthostatic hypotension and syncope.<sup>13</sup> Dollery and Harington<sup>24</sup> reported that older patients are more sensitive to the antihypertensive and central nervous system depressant effects of methyldopa. It has also been suggested that the use of reserpine be discouraged because of the drug's ability to produce gastric ulceration and psychic depression.<sup>13</sup>

Hydrochlorothiazide is a valuable agent for the treatment of hypertension and renal impairment. It is impossible from our data to determine whether more of the drug was used to treat one or the other of these disorders. It is generally recognized that the elderly are more susceptible to the complications of diuretic therapy. The side effects of hydrochlorothiazide therapy include hypokalemia with associated digitalis toxicity, impaired glucose tolerance, hyperuricemia and occasionally symptomatic gout. Hypovolemia with hypotension, dehydration with prerenal azotemia, acid-base imbalance, hyponatremia, and urinary incontinence and retention have been reported, particularly with furosemide, but also occasionally with thiazide diuretics.<sup>13</sup> Caranasos, Stewart and Cluff<sup>25</sup> reported that 6% of adverse drug reactions were related to the use of diuretics, and Cheung and Kayne<sup>26</sup> found in a survey of three extended-care facilities that diuretics were involved in over 20% of the adverse drug reactions. It is apparent, therefore, that, although diuretics such as hydrochlorothiazide and furosemide are valuable therapeutic tools, care should be taken to reduce the likelihood of side effects of their use.

Several approaches may be taken to prevent or reverse the hypokalemic effect of hydrochlorothiazide. One is to incorporate triamterene in the drug regimen. In this regard it is interesting to note that the frequency of prescription of the hydrochlorothiazide-triamterene combination was almost equal to that of hydrochlorothiazide alone. Chlorthalidone mimics in most ways the effects of the thiazides, and elderly patients are more subject to the hypokalemic effects of this drug. An increased frequency of prescription of chlorthalidone in the elderly without concomitant potassium supplementation may result in more marked hypokalemia in the elderly.

Furosemide is a potent loop diuretic. Its greater use

in the elderly was striking, and it accounted for approximately 47% of the prescriptions for diuretics for those 65 years of age or older in our study. It is impossible to determine the clinical indications for its use in the elderly and the reasons for selecting it over a thiazide. However, physicians prescribing furosemide should be aware of its potent diuretic action and its side effects, including acute hearing loss,<sup>27</sup> before prescribing it.

In its review of diuretics in the elderly<sup>28</sup> the *British Medical Journal* pointed out that, although diuretics have revolutionized the management of heart failure and most are useful in the treatment of hypertension, they should only be used when there is a good clinical indication and adequate facilities exist for clinical and biochemical follow-up.

#### *Use of central nervous system drugs in the elderly*

Drugs acting on the central nervous system accounted for almost one third of all the formulary drugs prescribed in Saskatchewan during 1976. Because of their different therapeutic applications, they will be discussed in three categories: antidepressants, tranquilizers, and sedatives and hypnotics.

Depression can usually be classified as endogenous or reactive. Depression in the elderly is often reactive, commonly to bereavement or a change in the environment. Loss of interest, feelings of hopelessness and unworthiness, and magnification of relatively minor somatic symptoms are also frequent. The tricyclic antidepressants, such as amitriptyline, trimipramine and imipramine, have not enjoyed great success in the treatment of reactive depression. It was therefore comforting in our study to find that they were not used as frequently in the elderly as one might have expected. The difference in their use in the group aged 85 years and over, compared with the middle-aged population, was not pronounced. Physicians should be aware, however, that older patients are often particularly sensitive to the central and peripheral side effects of the tricyclic antidepressants. Unless the starting dose is smaller than average the patient may become excessively drowsy and later show confusion and psychomotor excitement.<sup>29</sup> The elderly may also be subject to urinary retention and constipation with the use of these drugs. Postural hypotension, cardiac arrhythmias and glaucoma may also occur.<sup>30</sup>

The benzodiazepines diazepam and chlordiazepoxide hydrochloride were the psychoactive drugs most often prescribed for both the elderly and the middle-aged in our study. Prescriptions for diazepam represented 56% of all orders for psychoactive drugs for persons aged 65 years or over, and 66% of those for persons aged 35 to 54 years. Although the high rate of use of diazepam in the middle-aged group is disconcerting, some solace can be derived from the fact that a dramatic increase in the rate of use of diazepam in the elderly was not noted. However, an increase in the frequency of clinical depression of the central nervous system by diazepam and chlordiazepoxide with increasing age has been noted in the Boston Collaborative Drug Surveillance Program<sup>31</sup> and by Greenblatt, Harmatz and Shader.<sup>32</sup>

The phenothiazines thioridazine, chlorpromazine, tri-

fluoperazine and prochlorperazine were prescribed less frequently for our study population than the benzodiazepines diazepam and chlordiazepoxide hydrochloride. However, unlike the benzodiazepines, the phenothiazines and the butyrophenone haloperidol were much more frequently prescribed for the elderly than for the middle-aged. The phenothiazines and haloperidol are classified as antipsychotic drugs. They also possess sedative and hypnotic properties, and it is likely that their increased use in the elderly was for daytime sedation or night-time hypnosis. However, the phenothiazines differ in their effects: chlorpromazine is noted for its sedative effects, whereas trifluoperazine and prochlorperazine are not strongly sedating. Another factor to be considered is the reportedly increased susceptibility to the extrapyramidal actions of these drugs in the elderly. The peak frequency of akathisia occurs between the ages of 40 and 50 years, and that of akinetic parkinsonism occurs around 80 years.<sup>33</sup> Choreiform side effects from long-term phenothiazine therapy are five times more frequent in an aged than a young population.<sup>33</sup>

Sedatives and hypnotics accounted for 15% of all the central nervous system drugs prescribed for the age group 65 years or over, but, as was previously mentioned, the use of these drugs was probably underestimated. Of the prescriptions for sedatives and hypnotics more than half (56%) were for a barbiturate. This is disconcerting, for the increased sensitivity of the aged to barbiturates is well known.<sup>34</sup> In a significant proportion of elderly patients paradoxical responses ranging from mild restlessness to frank psychosis have been seen.<sup>35</sup> As well, these agents have been shown to be a significant cause of nocturnal falls and femoral fractures in elderly patients.<sup>36</sup> Judge and Caird<sup>37</sup> have stated that barbiturates should never be used in elderly people except those with epilepsy, and in several editorials in noted medical journals in both the United Kingdom and the United States the use of barbiturates as hypnotics has been condemned.<sup>38-40</sup>

Benzodiazepines such as flurazepam and oxazepam have clinical indications for use in the treatment of insomnia. Furthermore, they are less likely than barbiturates to produce prolonged depression. This is particularly true for oxazepam, which has a half-life of 3 to 8 hours. Flurazepam is metabolized to an active chemical, desalkylflurazepam, which has a long half-life (47 to 100 hours). Nightly administration of flurazepam results in accumulation of the slowly eliminated active metabolite. As a result, drowsiness may be seen during long-term use, especially in elderly or debilitated patients. Ataxia, confusion and hallucinations are also more frequent in these patients.<sup>41</sup>

The preceding discussion presupposes that phenobarbital was used as a sedative or hypnotic or both. The drug is also a popular agent for the treatment of epilepsy. It is impossible to determine how much the drug was used for this indication. It is, however, clear that such agents as secobarbital, pentobarbital sodium, amobarbital and butobarbital were used for their sedative and hypnotic properties. Such use should be discouraged.

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## Évolution précoce et tardive après pontage aortocoronarien: expérience de 500 cas

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De 1971 à 1976, 500 patients ont subi un pontage aortocoronarien. Il y eut 15 décès opératoires (3%) et la fréquence globale d'infarctus peropératoire fut de 7%. Dans l'angine instable la mortalité fut de 7.4%, comparativement à 1.1% dans l'angine stable ( $P < 0.01$ ). Le taux de perméabilité des greffons fut de 92% 2 semaines après la chirurgie et de 87.6% après 18 mois. L'évolution postopératoire a été suivie chez 99% des opérés. Il y eut 15 décès tardifs (3%) et les taux de survie à 2 et à 4 ans furent de 94.4% et de 92.1% respectivement. Il n'y a pas de différence significative entre la courbe actuarielle de survie des opérés et celle de la population générale. Après une évolution moyenne de 27 mois 73% des patients demeurent complètement exempts d'angine et 19% sont nettement améliorés. Le taux de récurrence de l'angine fut de 10% par année et la fréquence annuelle d'infarctus fut de 0.7%. Quatorze patients (3%) ont dû être réopérés au cours de cette période d'observation. La revascularisation chirurgicale offre donc un soulagement efficace et soutenu de la douleur angineuse invalidante et pourrait améliorer la survie si la mortalité opératoire est minime.

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Between 1971 and 1976, 500 patients underwent aortocoronary bypass surgery. There were 15 operative deaths (3%) and the total frequency of perioperative infarction was 7%. The operative mortality was 7.4% in unstable angina, as compared with 1.1% in stable angina ( $P < 0.01$ ). The proportion of grafts patent at 2 weeks was 92% and at 18 months 87.6%. Postoperative follow-up was complete for 99% of the patients. There were 15 late deaths (3%) and the rates of survival at 2 and 4 years were 94.4% and 92.1% respectively. The actuarial curve of survival after surgery was not significantly different from that of the general population. After a mean follow-up of 27 months 73% of the patients were completely free of angina and 19% were markedly improved. The rate of recurrence of angina averaged 10% per year and the annual infarction rate was 0.7%. Fourteen patients (3%) underwent reoperation during the follow-up period. Thus, coronary revascularization surgery offers effective and sustained relief of incapacitating angina and might also improve survival if the operative mortality is low.

Depuis 10 ans le pontage aortocoronarien s'est assuré une place prépondérante dans le traitement de la maladie cardiaque ischémique. Son efficacité à soulager la douleur angineuse à court terme est bien établie et explique la grande faveur dont elle jouit actuellement.<sup>1</sup> Toutefois, malgré son application extensive on n'a pu encore démontrer que le traitement chirurgical est susceptible de prolonger la vie et de diminuer la