

# Elderly patients in general practice: diagnoses, drugs and inappropriate prescriptions. A report from the Møre & Romsdal Prescription Study

Jørund Straand and Kirsten Skinlo Rokstad

Straand J, Rokstad K. Elderly patients in general practice: diagnoses, drugs and inappropriate prescriptions. A report from the Møre & Romsdal Prescription Study. *Family Practice* 1999; **16**: 380–388.

**Background.** Elderly patients are particularly vulnerable and most at risk of suffering adverse drug reactions, which are often caused by inappropriate prescribing practice. Gaining insight into physicians' drug prescribing patterns in order to identify prescribing problems is the fundamental first step in trying to improve the quality of prescribing.

**Objectives.** We aimed to describe drug prescribing in general practice for elderly patients, using patients' age and sex, encounters, indications for prescribing and the occurrence of some predefined inappropriate drug prescriptions.

**Methods.** A cross-sectional, descriptive study was conducted in the Norwegian county of Møre & Romsdal. All patient contacts ( $n = 16\ 874$ ) and prescriptions ( $n = 16\ 774$ ) issued during two months in general practice were recorded. In defining inappropriate prescriptions, explicit criteria were used.

**Results.** Prescriptions (of which 72% were repeat) were issued during two-thirds of all contacts, and 63% were for females. Seventy per cent of all prescriptions were made up by the ten most commonly prescribed therapeutic groups, for which the three most frequent diagnostic indications for prescribing comprised between 47 and 89% of all diagnoses for prescribing each of them. About one in six patients who received a benzodiazepine tranquillizer was concurrently prescribed another benzodiazepine for sleeping problems. In total, 13.5% of all prescriptions met at least one of the criteria listed for pharmacological inappropriateness.

**Conclusion.** Inappropriate drug prescriptions for elderly patients are common in general practice. Since the majority of the prescribing practice is made up by rather few diagnoses and drugs, improved practice for only a few may nevertheless have a large impact on the total profile.

**Keywords.** Drug utilization, elderly, general practice, prescriptions.

## Introduction

A disproportionate number of elderly people suffer from chronic and degenerative pathology, leading in turn to a demand for more medication.<sup>1–3</sup> However, knowledge about the efficacy and safety of many drugs is often sparse for the frail elderly because they are generally excluded from clinical trials.<sup>4</sup>

While being the major consumers and the greatest beneficiaries of modern drug therapy, elderly patients are particularly vulnerable and most at risk of suffering

adverse drug reactions (ADRs).<sup>2,5,6</sup> Their increased vulnerability is caused by lower reserve capacities and slower homeostatic responses, but with many drugs there are also age-related changes in drug distribution in the body and in drug clearance.<sup>5,6</sup>

ADRs in the elderly have been characterized as “a major modern epidemic”.<sup>6</sup> The control of this ‘epidemic’ demands insight into physicians' drug prescribing patterns, because the identification of the quantity and the type of prescribing problems are the fundamental first steps in trying to improve the quality of prescribing.<sup>2</sup>

ADRs in the elderly are in fact often caused by inappropriate prescribing.<sup>7</sup> Studies from the UK,<sup>8</sup> from the USA<sup>9,10</sup> and from Canada<sup>11</sup> indicate that a substantial proportion of prescribing practice for the elderly is not consistent with appropriate care.

---

Received 15 March 1998; Revised 30 September 1998; Accepted 29 March 1999.

Division for General Practice, University of Bergen, Ulriksdal 8c, N-5009 Bergen, Norway.

Few comprehensive pharmacoepidemiological studies have been carried out to examine the overall drug prescribing for the elderly,<sup>1-3,9-12</sup> and this applies especially to general practice settings.<sup>13,14</sup> Studies on drug utilization for out-patients commonly use data from patient interviews during household surveys,<sup>9,10,15-17</sup> from pharmacy records,<sup>18</sup> or from health insurance funds data.<sup>11</sup> They do not usually include data on the physicians' indications for prescribing. The present study was undertaken to provide more insight into GPs' prescribing patterns for the elderly. The aims of the study were to describe GPs' drug prescribing practice for patients aged 65 and over in relation to the kind of GP-patient contacts, the diagnoses for the contacts, the patients' age and sex, the diagnostic indications for prescribing, and, finally, to examine the existence of some drug prescriptions considered generally inappropriate for elderly people.

## Methods

This paper is a report from the Møre & Romsdal Prescription Study (MRPS), in which more than 95% of the 156 GPs in the Norwegian county Møre & Romsdal recorded all contacts with patients and all prescriptions issued during November 1988 and November 1989. Two separate periods were chosen for the survey on the recommendation of an intervention study.<sup>19</sup> The aims of the MRPS were, first, to test the hypothesis that the GPs' prescribing practice can be improved (for insomnia and acute cystitis) by intervening with individual prescribing feedback and therapeutic recommendations,<sup>19</sup> and, secondly, to perform a prospective and comprehensive study on the GPs' drug prescribing practice, not to answer specific hypotheses, but to form a descriptive basis from which hypotheses could be generated.<sup>20-23</sup> More details on the methods of the MRPS can be found elsewhere.<sup>19-20</sup>

Briefly, the GPs used a prescription form, a carbon copy of which was retained with a questionnaire. On this, the GPs completed information about prescriptions (initial or repeat, indication for prescribing), and the GP-patient contact (type, diagnosis, first-time or follow-up). Indirect GP-patient contacts were contacts by telephone or via a third person (e.g. the receptionist).

The GPs were asked to select diagnoses from a list of the most frequently used diagnoses in general practice in terms of the The International Classification of Primary Care (ICPC).<sup>24</sup> During the analysis some related ICPC-codes were clustered, as can be seen from the tables.

The following age categories were used: the younger elderly (65-74 years) and older elderly (75+ years).

Drugs were classified according to the Anatomical Therapeutic Chemical Classification (ATC) system, and Defined Daily Doses (DDDs) were used as a quantitative unit for the drugs.<sup>25</sup>

Prescription of one drug counted as one prescription. There was space on each prescription sheet for three prescriptions. Co-prescribing was defined as prescriptions issued on the same prescription note. For ten drug combinations regarded as suboptimal or inappropriate, we examined the existence of their co-prescribing. The combinations chosen were selected based on our opinion of their clinical relevance and on the literature.<sup>2,5-7,14,26-28</sup>

In order to examine the occurrence of inappropriate drug prescriptions, we made up a list of explicit criteria regarding some drugs that should be avoided in the elderly, and some drugs for which there should be limitations regarding daily dose or duration of treatment, or on the indications for prescribing (Table 1). The list, which was tailored to the assessment of pharmacological inappropriateness for individual prescriptions, was based on previous studies from the MRPS on the GPs' prescribing patterns for benzodiazepine hypnotics,<sup>21</sup> diuretics<sup>22</sup> and antibiotics,<sup>23</sup> and on studies by others.<sup>29-33</sup>

Before the survey, each practice was visited by one of us (KSR) and the GPs were trained in how to fill in the questionnaires correctly. During the survey, a secretary or nurse in each practice served as a contact person (weekly telephone calls) between the investigators and the GPs. One of her main duties was to ensure that all contacts, irrespective of whether a prescription was made, were recorded.<sup>19</sup> As checked by the pharmacies, the GPs used the MRPS prescription forms in more than 99% of all prescriptions.<sup>19,20</sup>

## Material

In the MRPS, the GPs altogether made 74 079 drug prescriptions during 90 458 contacts. Due to an intervention study,<sup>19</sup> those who had received the intervention (20 615 contacts with 17 321 prescriptions) were excluded from analysis in the present study. Of those remaining, 16 874 contacts and 16 774 prescriptions were with patients aged 65 years or over, and they constitute the material for this article.

## Results

Of the 16 874 contacts, 50.2% were office consultations and 6.3% were home visits, while 43.5% were indirect contacts; office consultations became relatively less common with increasing patient age (Fig. 1).

The 16 774 prescriptions were issued during 66.4% of all contacts (79.5% of all indirect contacts, 56.8% of the office consultations and 42.9% of the housecalls). On average, 99.4 prescriptions were made per 100 GP-patient contacts; 72.1% of all the prescriptions were repeat: 57.9% and 87.3% of all prescriptions during direct and indirect contacts, respectively. The 317 chemically different agents that were prescribed represent

TABLE 1 *Drugs considered generally inappropriate for elderly patients, and drugs for which limitations on the daily dose, the duration of treatment or the indications for prescribing are recommended*<sup>21–23,29–33</sup>

Prescription drug (ATC-code)/Comments
<p>Medications to be avoided:</p> <ul style="list-style-type: none"> <li>• Chlorpropramide (A10BB02)</li> </ul> <p>Other oral hypoglycaemic drugs have shorter half lives and do not cause the syndrome of inappropriate antidiuretic hormone secretion.<sup>29</sup></p> <ul style="list-style-type: none"> <li>• Dipyridamole (B01AC07)</li> </ul> <p>Because aspirin is a safer and better alternative.<sup>29</sup></p> <ul style="list-style-type: none"> <li>• Methyldopa (C02AB01)</li> </ul> <p>Alternative antihypertensives give fewer central nervous system (CNS) side-effects.<sup>29</sup></p> <ul style="list-style-type: none"> <li>• Propranolol (C07AA05)</li> </ul> <p>For hypertension, alternative antihypertensives give fewer CNS side-effects.<sup>29</sup></p> <ul style="list-style-type: none"> <li>• Indomethacin (M01AB01)</li> </ul> <p>Other NSAIDs give fewer CNS side-effects.<sup>29</sup></p> <ul style="list-style-type: none"> <li>• Centrally acting muscle relaxants (M03B)</li> </ul> <p>Because their potential for toxic reactions is greater than the potential benefits.<sup>29</sup></p> <ul style="list-style-type: none"> <li>• Propoxyphene (N02AC54)</li> </ul> <p>Because there are safer alternatives.<sup>29</sup></p> <ul style="list-style-type: none"> <li>• Pentazocine (N02AD01)</li> </ul> <p>Because there are safer alternatives.<sup>29</sup></p> <ul style="list-style-type: none"> <li>• Amitriptyline (N06AA09)</li> </ul> <p>Because other antidepressants are less anticholinergic and less toxic.<sup>29</sup></p>
<p>Limitations on dose, duration or indication:</p> <ul style="list-style-type: none"> <li>• Gastrointestinal antispasmodics (A03), long-term use of</li> </ul> <p>Because the potential for toxic reactions is greater than the potential benefit.<sup>29</sup></p> <ul style="list-style-type: none"> <li>• Thiazides and related drugs (C03A, C03B, C03E) for hypertension, inappropriate high daily dose</li> </ul> <p>Because they have a quite flat dose to blood pressure response curve (whereas the side-effects are dose-dependent), the side-effects may easily outweigh the benefits.<sup>22</sup></p> <ul style="list-style-type: none"> <li>• Codeine-containing analgesics (N02BE51), long-term use of</li> </ul> <p>Because their superiority to plain analgesics, e.g. paracetamol, is only documented for acute pain and remains questionable for their prolonged use.<sup>31,32</sup></p> <ul style="list-style-type: none"> <li>• Benzodiazepines (N05BA, N05CD), long-term use of</li> </ul> <p>Because of the associations with daytime sedation, the risk of falls and the lack of documentation concerning their prolonged use.<sup>21,29–31</sup></p> <ul style="list-style-type: none"> <li>• Antipsychotics (N05A) for non-psychotic diagnoses</li> </ul> <p>Because their prolonged uses may do more harm than good.<sup>30</sup></p> <ul style="list-style-type: none"> <li>• Antibiotics (J01) prescribed during first-time encounter for acute bronchitis</li> </ul> <p>Because acute bronchitis usually has a viral aetiology.<sup>23,33</sup></p>

42.2% of all the compounds which were available for prescribing during this survey.

Altogether, the three major cardiovascular diagnoses, hypertension (HT), coronary heart disease (CHD) and heart failure (HF), amounted to 19% of all diagnoses for the contacts (Table 2). HT was the most frequent diagnosis for females and the younger elderly patients, while HF was the most common diagnosis (9.6% of all) for office consultations with the oldest age group (85+ years),

and for seeing patients in their homes (6.1% of all diagnoses for home visits). While insomnia, anxiety and depression made up 14% of the reasons for contact for female patients, the corresponding figure for males was significantly lower, 10%. While 70–75% of the patients who saw their GPs for HT, CHD or HF were given prescriptions (of which about 90% were repeat) during the contact, another 20, 21 and 23%, respectively, were also taking drugs for these diagnoses but the prescriptions

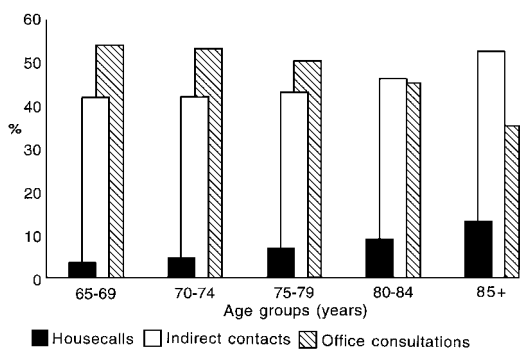


FIGURE 1 Distribution of the different GP-patient contacts (n = 16 874), by patients' age groups

for these additional preparations had been issued previously (Table 2).

In total, 63.3% of the drug prescriptions were for females and 53.2% were for the younger elderly (Table 3). More than half of all the prescriptions, and about two-thirds of the volume prescribed, were for cardiovascular drugs (relatively more common for males) and CNS drugs (more common for females) (Table 3). Drugs acting on the musculoskeletal system, and for respiratory organs, amounted to more of the overall prescribing for the younger elderly than for the older elderly (Table 3).

The ten most frequently prescribed therapeutic groups of drugs, and the three most commonly recorded indications for prescribing each of them, are shown in Table 4. One out of five prescriptions were for psycholeptics, of which 89.7% were benzodiazepines. Listed second was

TABLE 2 The 20 most common diagnoses for GP-patient contacts by patients' sex, age group and prescriptions (Rx) issued during this contact (Rx now), previously (Rx before) or who were not on drug treatment (not Rx)

No.	Diagnosis	ICPC-codes	All contacts		Gender %↓		Age group (years) %↓		Rx for this diagnosis?			
			n	%↓	♂	♀	65-74	75+	Rx now	Rx before	Not Rx	Repeat Rx <sup>a</sup>
1.	Hypertension	K85/86/87	1403	8.3	6.9	9.3	9.3	7.1	75	20	5	93
2.	Coronary heart disease	K07/74/89/91	1114	6.6	8.4	5.4	6.7	6.6	72	21	7	89
3.	Insomnia	P07	1110	6.6	5.6	7.2	5.6	7.8	99	1	-	87
4.	Heart failure	K75/77	695	4.1	4.6	3.8	2.4	6.2	70	23	7	88
5.	Diabetes	T90	693	4.1	4.3	4.0	4.1	4.1	48	39	13	92
6.	Acute cystitis	U71	671	4.0	2.4	5.0	3.4	4.7	88	4	8	32
7.	Arthritis/arthrosis	L88/89/90/91	664	3.9	2.7	4.7	3.9	3.9	67	19	14	77
8.	Anxiety/neurosis	P1/4/74	554	3.3	2.2	4.0	3.7	2.8	92	6	2	87
9.	Depression	P02/76	430	2.6	2.2	2.8	2.9	2.1	78	12	10	80
10.	Asthma	R96	330	2.0	2.9	1.3	2.1	1.7	85	11	4	87
11.	Cough and cold	R5/7/21/22/23/74	286	1.7	1.6	1.7	1.7	1.6	83	5	12	25
12.	Eczema	S86/87/88	261	1.6	1.8	1.4	1.8	1.3	94	3	3	58
13.	Low back pain	L2/3/84/86	260	1.5	1.7	1.5	1.8	1.2	62	9	29	63
14.	Cardiac arrhythmias	K4/78/79/80	256	1.5	1.8	1.3	1.6	1.4	62	29	9	87
15.	Acute bronchitis	R76	196	1.2	1.4	1.0	1.2	1.2	85	9	6	22
16.	Anaemia	B80/81/82	184	1.1	1.3	0.9	0.9	1.4	59	23	18	77
17.	Infectious conjunctivitis	F70	158	0.9	0.8	1.0	0.9	0.9	94	2	4	34
18.	Stroke	K90	152	0.9	1.4	0.6	0.8	1.0	26	41	33	84
19.	Dizziness	N17	149	0.9	0.7	1.0	0.7	1.1	61	11	28	63
20.	Pneumonia	R81	121	0.7	0.9	0.6	0.6	0.9	68	17	15	10
Sun % (1-20)			9687	57.5	55.6	58.5	56.1	59.0				
Other diagnoses			7187	42.5	44.4	41.5	43.9	41.0				
n = (100%)			16 874		6705	10 169	9177	7697				

<sup>a</sup> The proportions of the 'Rx now' that are repeat prescriptions.

TABLE 3 GPs' drug prescriptions (n = 16 774) for elderly (65+ years) patients according to the ATC system main groups by patients' sex, age group and the prescribed volume<sup>a</sup>

Drugs (ATC anatomical main classes)	Prescriptions										
	Numbers		Patients' sex			Age groups (years)			Volume prescribed		
	n	%	♂	♀	Δ <sup>c</sup>	65–74	75+	Δ <sup>c</sup>	DDDs	%	DDD/P
Alimentary tract and metabolism	1200	7.2	7.0	7.3	–	6.6	7.8	!	61 287	7.4	51.3
Blood and blood-forming organs <sup>b</sup>	354	2.1	3.1	1.5	!	1.9	2.3	–	52 509	6.3	154.0 <sup>d</sup>
Cardiovascular system	4590	27.4	30.7	24.5	!	26.8	28.0	–	321 662	38.9	72.5
Dermatologicals <sup>b</sup>	716	4.3	5.2	3.7	!	4.7	3.8	!	359	<0.1	6.3
Genitourinary system and sex hormones	388	2.3	0.9	3.1	!	2.3	2.3	–	18 525	2.2	47.8
Systemic hormonal preparations, excl. sex hormones	398	2.4	2.0	2.6	!	2.7	2.0	!	26 659	3.2	67.0
General systemic anti-infectives	1261	7.5	7.1	7.8	–	7.4	7.6	–	12 183	1.5	9.7
Antineoplastic and immunomodulating agents	25	0.1	0.1	0.2	–	0.1	0.2	–	2140	0.3	85.6
Musculoskeletal system	918	5.5	5.1	5.7	–	6.0	4.9	!	34 319	4.2	37.5
Central nervous system	4991	29.8	25.1	32.5	!	29.8	29.8	–	219 298	26.5	44.0
Antiparasitic products	1	<0.1	<0.1	<0.1	–	<0.1	0.0	–	2	<0.1	2.0
Respiratory organs	1347	8.0	10.2	6.8	!	8.6	7.4	!	70 710	8.6	52.5
Sensory organs <sup>b</sup>	571	3.4	3.4	3.4	–	3.1	3.8	–	6623	0.8	51.7
Various <sup>b</sup>	14	0.1	0.2	<0.1	!	0.1	0.1	–	35	0.1	7.0
SUM	16 774	100.0	100.0	100.0		100.0	100.0		826 312	100.0	53.4
			36.7	63.3		53.2	46.8				
n	16 774		6156	10 618		8931	7843				

<sup>a</sup> Given in numbers of Defined Daily Doses (DDDs), and mean DDDs per prescription (DDD/P).

<sup>b</sup> Some preparations do not have a DDD. Among these are (ATC group): plasma substitutes and perfusion solutions (B05), other haematological agents (B06), dermatologicals for topical use (D), otologicals (S02), ophthalmology/otological preparations (S03), other therapeutic products (V03) and diagnostic agents (V04).

<sup>c</sup> The 99% confidence interval for the difference between the proportions: the interval either does not include zero (!) or does include zero (–).

<sup>d</sup> Relatively large volume caused by Rx for injectable vitamin B12, usually in quantities corresponding to about 1 year's supply per prescription.

cardiac therapy (ATC-group C01), of which nitrates constituted 60.2% and digitalis preparations 36.8%.

Co-prescribing of ten potentially harmful drug combinations are shown in Table 5. Among the 10 drug combinations examined, the most commonly occurring, in about one out of six patients, was that about one in six patients who got a benzodiazepine tranquillizer, concurrently were given another benzodiazepine to promote sleep. Of the 489 diuretic prescriptions for HF, only 2.2% were co-prescribed with an ACE inhibitor.

Altogether, 13.5% of all prescriptions met any of the criteria listed in Table 1 for inappropriate or questionable drug prescriptions for elderly people (Table 6).

## Discussion

The MRPS is so far the largest study on drug prescribing in Norway. Because almost all eligible GPs participated,

and they had high compliance in using the specially designed prescription pads, the internal validity of the MRPS is high.

A possible limitation may be a possible underreporting of contacts during which drug prescriptions were not issued, since we do not have data on the GPs' compliance in recording such contacts. However, that prescriptions were not issued during about one-third of all the recorded contacts suggests that large scale underreporting of such contacts is unlikely to have occurred. Since there were no explicit criteria for the diagnoses used, the request for a drug and its prescribing may have led to a certain diagnosis instead of vice versa (e.g. the request for sleeping pills and the diagnosis of insomnia). However, we believe that the diagnoses recorded here are representative of diagnoses used during everyday practice.

It is not surprising that indirect contacts and house-calls made up a larger share of the GP–patient contacts

TABLE 4 The 10 most frequently prescribed drugs (ATC system therapeutic groups) for elderly patients in general practice by the three most commonly recorded indications for prescribing within each therapeutic group

Drugs				The three most commonly recorded diagnostic indications for prescribing (%)						
No.	ATC-code	Therapeutic group	% of all prescriptions	1st indication	(%)	2nd indication	(%)	3rd indication	(%)	Indications 1 + 2 + 3 (%) of all
1.	N05	Psycholeptics	20.5	Insomnia	(52)	Anxiety	(26)	Depression	(9)	87
2.	C01	Cardiac therapy	9.3	Coronary heart disease	(58)	Heart failure	(21)	Cardiac arrhythmias	(8)	87
3.	C03	Diuretics	8.0	Hypertension	(45)	Heart failure	(37)	Coronary heart disease	(4)	86
4.	J01	Antibiotics	7.5	Acute cystitis	(41)	Acute bronchitis	(13)	Pneumonia	(7)	61
5.	N02	Analgesics	6.0	Unspecified pain <sup>a</sup>	(19)	Arthritis/arthrosis	(16)	Musc./tend./joint. <sup>b</sup>	(12)	47
6.	C02	Antihypertensives	5.0	Hypertension	(65)	Coronary heart disease	(14)	Cardiac arrhythmias	(9)	88
7.	C07	Beta-blocking agents	4.0	Hypertension	(50)	Coronary heart disease	(34)	Cardiac arrhythmias	(5)	89
8.	M01	NSAIDs	3.9	Arthritis/arthrosis	(54)	Musc./tend./joint. <sup>b</sup>	(19)	Shoulder syndromes <sup>c</sup>	(3)	76
9.	R03	Anti-asthmatics	3.3	Asthma	(80)	Acute bronchitis	(5)	Chronic bronchitis <sup>d</sup>	(4)	89
10.	S01	Ophthalmologicals	3.0	Infect. conjunctivitis	(46)	Glaucoma <sup>e</sup>	(22)	Other conjunctivitis <sup>f</sup>	(6)	74
Sum (1–10) %			70.5							
Others %			29.5							
<i>n</i> = (100%)			16 774							

<sup>a</sup> ICPC code A01.

<sup>b</sup> Muscles, joints and tendons: unspecified symptoms/complaints; ICPC-codes L19 + 20 + 93.

<sup>c</sup> ICPC-codes L06 + 08 + 09 + 92.

<sup>d</sup> ICPC-code R91.

<sup>e</sup> ICPC-code F93.

<sup>f</sup> ICPC-code F71.

for the older elderly; they probably have more chronic pathology and are thus less mobile than the younger elderly.

The large proportion of repeat prescriptions issued during indirect contacts may raise some concern, especially if the GPs omit to assess the patients, as found in a UK study in which 23% of the patients had been receiving repeat prescriptions for more than a year without seeing their GP.<sup>2</sup> However, in this study we have no data on longitudinal patterns of contacts and prescriptions nor on the GP–patient relationship, both of which are essential for assessing appropriate care in prescribing practice.<sup>34</sup>

The distribution of diagnoses in general practice seem to be quite stable over time.<sup>35</sup> Even though this is a survey of reasons for contact and on drug prescribing practice, and not a prevalence study, the distribution of diagnoses for contact are not very different from results reported in prevalence studies from Sweden,<sup>36</sup> Denmark<sup>37</sup> and the UK,<sup>38</sup> and so it seems worth commenting

on the diagnostic data of our study. Generally, hypertension and heart diseases are the most common problems. Women tend to be given the diagnosis of HT more often than men, while men more often suffer from CHD, arrhythmias and HF. This corresponds well a systematic health survey among elderly people in Northern Sweden,<sup>36</sup> and the surgery consulting patterns for elderly patients in UK general practice.<sup>38</sup>

Pharmacoepidemiological studies usually do not include data on the physician's indications for prescribing. In fact, we have not found any other comprehensive and representative study on GPs' prescribing practice for elderly patients that also includes information on the GPs' diagnostic indications for prescribing the various drugs. Information about diagnostic indication is vital for the assessment of prescriptions because the same compound may be prescribed both for minor complaints and for serious pathology, e.g. the same diuretic may be given for narrow shoes due to orthostatic oedemas, for HT or for congestive HF.<sup>22</sup>

TABLE 5 Drug prescriptions (Rx) for elderly patients in general practice: existence of co-prescribing (i.e. on the same prescription sheet) of 10 clinically significant drug combinations

Drug A		Drug B		Co-prescribing	Drug-Drug interaction
Drug	Number of Rx	Drug	Number of Rx	Rx drugs (A + B) (% of drug A)	Potential harm
Madopar	52	Neuroleptics	354	4 (7.7)	Drug-induced Parkinsonism?
Beta blockers	666	Anti-asthmatics	549	2 (0.3)	Drug-induced asthma?
Calcium antagonists <sup>a</sup>	344	Beta blockers	666	38 (11.0)	Cardiac block, bradycardia
Potassium sparing diuretics	377	Potassium supplements	270	17 (4.5)	Hyperkalaemia
ACE-inhibitors	118	Potassium supplements	270	3 (2.5)	Hyperkalaemia
ACE-inhibitors	118	Potassium sparing diuretics	377	4 (3.4)	Hyperkalaemia
NSAIDs	652	Diuretics	1339	40 (6.1)	Fluid retention, hypertension
Benzodiazepine-tranquillizers	1285	Benzodiazepine-hypnotics	1739	217 (16.9)	Impaired cognition, oversedation and risk of falls and fractures
Methyldopa	207	Antidepressants	370	3 (1.4)	Drug-induced depression
Warfarin	139	Aspirin or NSAID	689	3 (2.2)	Increased risk of bleedings

<sup>a</sup> Verapamil, 170; nifedipin, 155; diltiazem, 19.

The finding that on average eight out of ten patients were on drug treatment for the diagnosis for seeing their GP underlines the essential role of drug treatment of chronic conditions in the elderly. That the three most common indications for prescribing each of the three most frequently issued drugs (therapeutic groups) made up 86–87% of all the indications is also an important message for prescribing audits and for continuing medical education: improved prescribing practice for rather few drugs or diagnoses may nevertheless have a large impact on the total profile.

Our figures regarding co-prescribing should be interpreted as ‘the tip of the iceberg’ because we only recorded co-prescribing as occurring when more than one prescription was made on the same prescription sheet issued during the same prescribing event. According to our experience, GPs quite often renew various repeat prescriptions for the same patient at different intervals and during different contacts. In order to reduce the incidence of inappropriate drug combinations, GPs should probably more often establish routines for assessing the total medication of their patients, e.g. during prescribing if all repeat prescriptions for the patient are issued together. Beneficial co-prescribing of an ACE inhibitor with a diuretic for HF occurred in only one of about 45 cases, which suggests an underprescribing of ACE inhibitors. This may be because the recommendation of combining the two drugs in HF had not been fully adopted in clinical practice during this survey; however,

under-utilization of ACE inhibitors in HF has also been reported by others based on more recent data.<sup>39</sup>

That altogether 15.5% of the prescriptions met any of the criteria listed for suboptimal drug combinations (2.0%) or inappropriate prescriptions (13.5%) is in accord with two out-patient studies from the USA, in which between 14%<sup>9</sup> and 23.5%<sup>10</sup> of the elderly patients were found to receive inappropriate prescriptions. One of the studies<sup>10</sup> applied the criteria developed by Beers *et al.* in 1991<sup>29</sup> for inappropriate medication use in nursing homes, while the other<sup>9</sup> modified these criteria by omitting propranolol and methyldopa from the list. A Canadian study compared prescribing practice (limited to NSAIDs, cardiovascular and psychotropic drugs) with detailed criteria developed by a consensus panel, and showed that more than 50% of the elderly patients experienced high-risk prescribing.<sup>11</sup> Because the present and the cited studies<sup>9–11</sup> all employ different lists (none of which is officially recognized) of inappropriate prescriptions, the results in the various studies cannot be compared directly. However, all studies point in the same direction: inappropriate prescriptions represent an important health problem for elderly patients and a major challenge for general practice.<sup>40</sup> However, there are several limitations in using a ‘black-list’ as a gold standard for inappropriate or questionable prescribing practice. First, most of the guidelines used are consensus-based rather than evidence-based.<sup>29,41</sup> For example, that the prolonged use of benzodiazepines is inappropriate still

TABLE 6 GPs' prescriptions for elderly patients (65+ years): drug prescriptions generally considered inappropriate for the elderly

Prescription drug	No. of prescriptions
Medications to be avoided	
Chlorpropramide	3
Dipyridamole	1
Methyl dopa	207
Propranolol	106
Indomethacin	35
Centrally acting muscle relaxants	191
Propoxyphene <sup>a</sup>	51
Pentazocine	7
Amitriptyline	119
Limitations on dose, duration or indication	
Long-term use <sup>b</sup> of gastrointestinal antispasmodics	11
Inappropriate high daily dose <sup>c</sup> of thiazides and related drugs prescribed for hypertension	185
Long-term use <sup>d</sup> of codeine-containing analgesics <sup>a</sup>	157
Long-term use <sup>b</sup> of benzodiazepines	782
Antipsychotics for non-psychotic diagnoses <sup>c</sup>	293
Antibiotics during first-time encounter for acute bronchitis	116 <sup>f</sup>
Total No. of Rx open for question	2264 (13.5%)
Other Rx	14 510 (86.5%)
Total No. of Rx	16 774 (100.0%)

<sup>a</sup> In Norway only available in compound analgesic with paracetamol (acetaminophen).

<sup>b</sup> Defined as repeat prescription for more than 30 DDDs and with the direction to be used on a daily basis.

<sup>c</sup> Daily doses (when prescribed for hypertension) exceeding 2.5 mg for bendroflumethazide, 25 mg for hydrochlorothiazide, 1 mg for polythiazide, 2 mg for trichlormethiazide, 25 mg for chlorthalidone or 50 mg for mefruside.

<sup>d</sup> Defined as repeat prescription for amounts corresponding to 50 tablets or more (each of 30 mg codeine and 400 mg paracetamol) and with the direction to be taken on a daily basis.

<sup>e</sup> Neuroleptics prescribed for the following diagnoses (ICPC-code) were not included here: senile psychosis/dementia/Alzheimer's disease (P70), organic psychosis (P71), schizophrenia (P72), affective psychosis (P73) and other psychiatric illness (P99).

<sup>f</sup> Tetracyclines, 83; phenoxymethylpenicillin, 17; erythromycin, 9; other antibiotics, 7.

needs to be substantiated by evidence, since their long-term use has received remarkably little testing in clinical trials.<sup>27</sup> Secondly, what is considered inappropriate today may become evidence-based therapy tomorrow, e.g. the use of indomethacin in the prevention of Alzheimer's disease.<sup>42</sup> Thirdly, in individual patients there are often particulars justifying exceptions to the rules. While a set of explicit criteria<sup>29,40</sup> is feasible for research on inappropriateness in prescription databases, the use of implicit

criteria (e.g. regarding indication, effectiveness, dosage, ADRs, interactions) for the assessment of any medication may be more relevant for clinical practice, e.g. in the collaboration between pharmacists and GPs. So far, the only validated system for such assessment is the comprehensive and rather time-consuming Medication Appropriateness Index (MAI), which scores 10 different items (e.g. indication, effectiveness, dosage, interaction) per medication.<sup>43</sup> Based on our extensive literature review<sup>8</sup> and on the MAI, Cantrill *et al.*<sup>44</sup> have recently developed nine Prescribing Appropriate Indicators tailored for the assessment of long-term prescribing by UK GPs.

More appropriate use of prescription drugs is a key element in improving disease management for elderly patients in general practice. Too often elderly patients suffer adverse drug reactions caused by suboptimal or inappropriate drug prescriptions. Since prescriptions for the most frequent diagnoses and drugs constitute so large a proportion of the overall prescribing, improved practice for only a few diagnoses or drugs may nevertheless have a large impact on the total profile. We have indicated areas that should probably be targeted during future prescribing audits and in the continuing medical training of GPs. GPs must be better at integrating clinical and pharmacological perspectives when reviewing medications for their individual patients. We have shown that it is in fact possible to improve GPs prescribing practice for selected diagnoses by sending them prescribing feedback combined with therapeutic recommendations.<sup>19</sup>

## Acknowledgements

We are grateful to Per Fugelli and Hogne Sandvik for valuable comments during the preparation of this manuscript. We also thank all the GPs in Møre & Romsdal for their help in providing the data.

## References

- Landahl S. Drug treatment in 70–82-year-old persons. A longitudinal study. *Acta Med Scand* 1987; **221**: 179–184.
- Cartwright A, Smith C. *Elderly People, their Medicines, and their Doctors*. London: Routledge, 1988.
- Österlind P, Bucht G. Drug consumption during the last decade among persons born in 1902 in Umeå, Sweden. A longitudinal population study. *Drugs Aging* 1991; **1**: 477–486.
- Bugeja G, Kumar A, Banerjee Arup K. Exclusion of elderly people from clinical research: a descriptive study of published reports. *Br Med J* 1997; **315**: 1059.
- Denham MJ, George CF (eds). *Drugs in old age. New perspectives. British Medical Bulletin* 1990; **46** (The British Council; Edinburgh: Churchill Livingstone).
- Caird FI, Scott PJW. *Drug-induced Diseases in the Elderly*. Dukes MNG (series ed.) (Vol. 2 in the series 'Drug-induced disorders'.) Amsterdam: Elsevier, 1986.
- Lindley CM, Tully MP, Paramsothy V, Tallis RC. Inappropriate medication is a major cause of adverse drug reactions in elderly people. *Age Ageing* 1992; **21**: 294–300.



- 8 Buetow SA, Sibbald B, Cantrill JA, Halliwell S. Prevalence of potentially inappropriate long term prescribing in general practice in the United Kingdom, 1980–1995: systematic literature review. *Br Med J* 1996; **313**: 1371–1374.
- 9 Stuck AE, Beers MH, Steiner A, Aronow HU, Rubenstein LZ, Beck JC. Inappropriate medication use in community-residing older people. *Arch Intern Med* 1994; **154**: 2195–2200.
- 10 Wilcox SM, Himmelstein DU, Woolhandler S. Inappropriate drug prescribing for the community-dwelling elderly. *JAMA* 1994; **272**: 292–296.
- 11 Tamblin RM, McLeod PJ, Abrahamowicz M *et al*. Questionable prescribing for elderly patients in Quebec. *Can Med Assoc J* 1994; **150**: 1801–1809.
- 12 Nolan L, O'Malley K. Prescribing for the elderly: Part II. Prescribing patterns: differences due to age. *J Am Geriatr Soc* 1988; **36**: 245–254.
- 13 Skegg DCG, Doll R, Perry J. Use of medicines in general practice. *Br Med J* 1977; **i**: 1561–1563.
- 14 Castleden CM, George CF. Prescription for the elderly. In O'Malley K (ed.). *Clinical Pharmacology and Drug Treatment in the Elderly*. Edinburgh: Churchill Livingstone, 1984: 71–98.
- 15 Chrischilles EA, Foley DJ, Wallace RB *et al*. Use of medications by persons 65 and over: data from established populations for epidemiologic studies of the elderly. *J Gerontol* 1992; **47**: M137–M144.
- 16 Lindberg J, Claesson C B, Cornelius C, Fratiglioni L, Thorslund M, Winblad B. Medicine use in the elderly. A population study in an urban area of Sweden. *Drug Invest* 1994; **8**: 241–253.
- 17 Anderson G, Kerluke K. Distribution of prescription drug exposures in the elderly: description and implications. *J Clin Epidemiol* 1996; **49**: 929–935.
- 18 Nolan L, O'Malley K. Age-related prescribing patterns in general practice. *Compr Gerontol* 1987; **1**: 97–101.
- 19 Rokstad K, Straand J, Fugelli P. Can drug treatment be improved by feedback on prescribing profiles combined with therapeutic recommendations? A prospective, controlled trial in general practice. *J Clin Epidemiol* 1995; **48**: 1061–1068.
- 20 Rokstad K, Straand J, Fugelli P. General practitioners' drug prescribing practice and diagnoses for prescribing: the Møre & Romsdal Prescription Study. *J Clin Epidemiol* 1997; **50**: 485–494.
- 21 Straand J, Rokstad K. General practitioners' prescribing patterns of benzodiazepine hypnotics: are elderly patients at particular risk for overprescribing? A report from the Møre & Romsdal Prescription Study. *Scand J Prim Health Care* 1997; **15**: 16–21.
- 22 Straand J, Rokstad K. Are prescribing patterns of diuretics in general practice good enough? A report from the Møre & Romsdal Prescription Study. *Scand J Prim Health Care* 1997; **15**: 10–15.
- 23 Straand J, Rokstad K. Prescribing systemic antibiotics in general practice. A report from the Møre & Romsdal Prescription Study. *Scand J Prim Health Care* 1998; **16**: 121–127.
- 24 Lamberts H, Wood M (eds). *ICPC. International Classification of Primary Care*. Oxford: Oxford University Press, 1987.
- 25 *ATC Classification and DDD Assignment*. Oslo: WHO Collaborating Centre for Drug Statistics Methodology, 1996.
- 26 Johnson AG, Nguyen TV, Day RO. Do nonsteroidal anti-inflammatory drugs affect blood pressure? A meta-analysis. *Ann Intern Med* 1994; **121**: 289–300.
- 27 Grad RM. Benzodiazepines for insomnia in community-dwelling elderly: a review of benefit and risk. *J Fam Pract* 1995; **41**: 473–481.
- 28 Dargie HJ. Calcium-channel blockers and the clinician. *Lancet* 1996; **348**: 488–489.
- 29 Beers MH, Ouslander JG, Rollinger I, Reuben DB, Brooks J, Beck JC. Explicit criteria for determining inappropriate medication use in nursing homes. *Arch Intern Med* 1991; **151**: 1825–1832.
- 30 Cooper JK. Drug treatment of Alzheimer's disease. *Arch Intern Med* 1991; **151**: 245–249.
- 31 Bloom JA, Frank JW, Shafir MS, Martiquet P. Potentially undesirable prescribing and drug use among the elderly. Measurable and remediable. *Can Fam Physician* 1993; **39**: 2337–2345.
- 32 Kjærsgaard-Andersen P, Nafei A, Skov O *et al*. Codeine plus paracetamol versus paracetamol of chronic pain due to osteoarthritis of the hip. A randomized, double-blind, multi-centre study. *Pain* 1990; **43**: 309–318.
- 33 Gonzales R, Sande M. What will it take to stop physicians from prescribing antibiotics in acute bronchitis? *Lancet* 1995; **345**: 665–666.
- 34 Barber N. What constitutes good prescribing? *Br Med J* 1995; **310**: 923–925.
- 35 Rutle O. *Focus on the Patient. An Analysis of Contacts with the General Practitioner* (in Norwegian). Report No. 1/1983. Oslo: Unit for Health Services Research, 1983.
- 36 Österlind P, Löfgren A, Sandman P, Steen B, Winblad B. Health disorders, and drug consumption in an elderly population in Northern Sweden. *Gerontology* 1986; **32**: 52–59.
- 37 Holstein BE, Almind G, Due P, Holst E. Self-reported health status and drug use among the elderly (In Danish, English summary). *Ugeskr Læger* 1990; **152**: 386–391.
- 38 McCormick A, Fleming D, Charlton J. *Morbidity Statistics from General Practice: Fourth National Study 1991–1992*. Office of population censuses and surveys. Series MB5 No. 3. London: HMSO, 1995.
- 39 Stafford RS, Saglam D, Blumenthal D. National patterns of angiotensin-converting enzyme inhibitor use in congestive heart failure. *Arch Intern Med* 1997; **157**: 2460–2464.
- 40 Gurwitz JH. Suboptimal medication use in the elderly. The tip of the iceberg. Editorial. *JAMA* 1994; **272**: 316–317.
- 41 Beers MH. Explicit criteria for determining potentially inappropriate medication use by the elderly. An update. *Arch Intern Med* 1997; **157**: 1531–1536.
- 42 Smalheiser NR, Swanson DR. Indomethacin and Alzheimer's disease. *Neurology* 1996; **46**: 583.
- 43 Hanlon JT, Schmader KE, Samsa GP *et al*. A method of assessing drug therapy appropriateness. *J Clin Epidemiol* 1992; **45**: 1045–1051.
- 44 Cantrill JA, Sibbald B, Buetour S. Indicators of the appropriateness of long-term prescribing in general practice in the UK: consensus development, face and content validity, feasibility and reliability. *Qual Healthcare* 1998; **7**: 130–135.