

Compliance with prescribed medicines: a study of elderly patients in the community

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SUMMARY. Compliance with regular medicine taking has been assessed in 81 patients, aged 65 and over, living at home. Interview assessment, home tablet count, and retrospective review of general practice prescription record cards provided three indices of compliance.

Deviation by more than 10 per cent from absolute adherence to the prescription was found in 53 per cent of all tablet counts and was significantly more common in women than in men. Errors were also more common when medicines were to be taken more than once daily.

The compliance index obtained by inspection of prescription records correlated closely with the index calculated from tablet counts ($r_s = 0.68$; $p < 0.001$) for 129 separate medicines taken regularly. Poor compliance with an individual medicine could be predicted accurately in 66 per cent of cases. A combination of prescription record inspection and interview assessment increased the accuracy of this prediction to 86 per cent.

These findings suggest that, using simple methods, the level of compliance can be accurately predicted in a substantial number of elderly patients at home.

Introduction

THE proportion of adults receiving prescribed medicines in a general practice population increases with age (Skegg *et al.*, 1977; Dunnell and Cartwright,

1972). The total number of drugs prescribed for patients over 65 is higher than for younger patients (Skegg *et al.*, 1977; Crooks *et al.*, 1975) and more than half of those over 75 are receiving repeat prescriptions for medicines to be taken regularly (Howie, 1977). Studies of elderly patients in the community have shown that fewer than half take their medicines exactly as prescribed (Schwartz *et al.*, 1962; Gibson and O'Hare, 1968) and that an appreciable number of the errors made are potentially serious (Schwartz *et al.*, 1962).

However, procedures for identifying those patients at risk are seldom part of general practice routine and few systems used to arrange repeat prescriptions incorporate any means of detecting poor compliance (Howie, 1977).

Aim

We decided to investigate a group of patients over 65 in one general practice to evaluate: 1. the frequency of errors in medicine taking; 2. the types of errors made; and 3. the extent to which patients making errors could be identified easily and reliably.

Method

Throughout this study we have assumed that the use of all medicines was clinically justified and that each medicine was prescribed correctly so that optimal benefit would result from absolute adherence to the prescription.

The patients

The sample was drawn from a total of 307 individuals, aged 65 and over, attended by one of us (A.S.). In this practice, details of each prescription are entered on a separate card which is kept with the FPC records and we were thus able to identify 131 elderly patients who were regularly receiving at least one medicine by mouth (excluding short courses of antibiotics) on the day the study began. The number of tablets or capsules of each medicine prescribed during the two years before this date was recorded in every case. Age, sex, date of birth, and address were also noted and all addresses were visited by one of us (I.W.).

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Table 1. Mental test score—questions used to assess orientation.

<i>Date of birth</i> —one point each for correct knowledge of date, month, and year
<i>Date (on day of visit)</i> —one point each for day, month, and year
<i>Age</i> —two points for correct answer, one point if answer incorrect by one year only
<i>Address</i> —one point for correct answer
Maximum total score = 9 points

Interview

Eighty-one patients were found at home and all agreed to be interviewed. Each patient's name, address, age, and date of birth were checked against the general practice records and the former occupation of the patient (or spouse) identified (OPCS, 1970).

All medicines in the patient's possession were inspected, the containers were examined, and their source noted. All information on each label was recorded and the patient was asked to read the direction on the label aloud to the interviewer to assess legibility. Questions were asked about the purpose of each medicine, the number of doses taken each day, and the timing and tablet content of each dose. Enquiry was also made about difficulties encountered in remembering to take doses and methods used to serve as reminders. Patients were asked how they obtained their prescriptions and their medicines and how they disposed of unused tablets. Finally, the answers to a standard series of questions were used to calculate a 'mental test score' (MTS) which ranged from 0 to 9 (Table 1). This test is a slightly abbreviated version of that evaluated by Qureshi and Hodkinson (1974).

It was later possible, with reference to the general practice records, to compare the patient's description of his actual dosage regimen with that recommended and obtain compliance index (a):

$$\frac{\text{total daily dose, as described by the patient}}{\text{total daily dose, as recommended by the doctor}} \times 100\%$$

Tablet count

With the patient's permission, the number of tablets remaining in each container was counted. These counts were later subtracted, where possible, from the number of tablets requested on the corresponding prescription to reveal how many had been removed from each container. Assuming all such tablets had been ingested, this enabled calculation of compliance index (b):

$$\frac{\text{number of tablets actually taken}}{\text{number of tablets recommended to be taken}} \times 100\%$$

Prescription record

A further measure of compliance was obtained from the general practice records for the preceding two years. The number of tablets of each medicine which should have been required by each patient receiving constant treatment during that period was compared with the actual number prescribed and expressed as compliance index (c):

$$\frac{\text{number of tablets prescribed}}{\text{number of tablets theoretically required}} \times 100\%$$

Statistical methods

The non-Gaussian distribution of compliance indices made it necessary to examine linear correlation using the Spearman rank correlation coefficient. The remaining comparisons were tested for significance using the chi-square test.

Results

The 307 registered patients aged 65 and over comprised 136 men and 171 women, and of these, over a third (48) of the men and almost half (83) of the women were taking at least one medicine regularly. We interviewed 27 men (56 per cent) and 54 women (64 per cent) in this category. Table 2 shows the age and sex distribution, which did not differ significantly from that of the patients who were not interviewed. Table 3 shows the distribution according to social class (excluding five women, whose husbands had been members of the armed forces and who could not be classified). One third of those interviewed lived alone, the remainder living with a spouse or other relative. In the case of five married couples, both partners were interviewed. Table 4 shows the mental test scores of the patients interviewed.

Medicines

Of the medicines prescribed, 194 were to be taken regularly and 11 to be taken as required. The total number of medicines taken by each patient varied between one and six (mean 2.5) and the total number of doses between one and four (mean 2.5) (Tables 5 and 6). These mean values were the same in the group of

Table 2. Distribution of patients according to age and sex.

	65 to 74	75 to 84	85 and over	Total
Men	19	8	0	27
Women	27	23	4	54
Total	46	31	4	81

Table 3. Distribution of patients according to social class.

	Social class					Total
	1	2	3	4	5	
Number of patients	10	18	36	10	2	76

Table 4. Mental test scores.

Score	3	4	5	6	7	8	9	Total
Number of patients	1	1	3	5	5	18	48	81

patients not interviewed at home. The total daily number of tablets varied from one to 17. Seventy-one patients (88 per cent) had been receiving at least one of their prescribed drugs for more than six months and 49 (61 per cent) for over two years. Non-prescribed medicines, which were taken by 42 patients, comprised aspirin or a preparation containing aspirin in over half (23), paracetamol in nine, and a laxative in 18.

Interview also revealed three patients who periodically took very old tablets, three who were keeping old bottles of tablets "in case they are needed", and a further eight who had retained partly full bottles without the specific intention of using the tablets again in the future. Four patients had duplicate bottles of one or more of their current medicines.

Responsibility for taking medicine

Seventy patients (86 per cent) were responsible for taking their own medicines, the remainder receiving assistance, in all but one case from a relative. Thirteen patients invariably sent someone else to collect their repeat prescriptions and five of these had not seen the doctor for over six months; all 13 took their medicines unsupervised. Of the patients managing their own doses, 23 (33 per cent) had devised their own memory aids which involved the transfer of either single or all doses required the following day or week to a separate container kept in a prominent place. (A retired pharmacist wrote out new and more detailed labels for her tablet bottles and a list of tablets and doses to be taken.)

Containers

The only two patients who had any difficulty removing tablets from their containers were also the only two with tablets in blister or foilwrapped push-out packs.

Only one bottle was unlabelled but four labels had important omissions such as the name of either the patient (two) or the drug (two). Moreover, 142 (73 per cent) of the labels for medicines taken regularly stated merely "Take as directed". Only two labels were not typewritten but, despite this, 45 (23 per cent) could not be read by the patients because the lettering was "too

Table 5. Number of drugs prescribed.

	1	2	3	4	5	6	Total
Number of patients	23	28	10	8	8	4	81

Table 6. Number of doses taken each day.

	1	2	3	4	Total
Number of patients	19	9	44	9	81

small". Nevertheless, for 189 of the 205 separate medicines (92 per cent) the precise regimen was faultlessly stated by the patients. This was also the case for 32 (71 per cent) of the medicines whose labels could not be read. The correct purpose of 148 (72 per cent) of the medicines was also known.

Eighteen labels were incorrectly dated in a way which suggested that the bottles, returned by the patient with each new prescription, had been refilled by the chemist without the label being updated. In one instance, five further prescriptions had been issued and exchanged since the date shown on the label.

Compliance

(a) *Interview assessment.* During the interview, it was found that 39 patients did not take at least one of their medicines as prescribed. A total of 53 medicines were involved and in 34 instances a positive reason was given. The commonest reason (15 medicines) was that patients were taking 'as required' medicines prescribed to be taken regularly. Seven medicines were considered unnecessary, in two cases because the patient now felt better. Six medicines had been stopped by the patients because of symptoms which were ascribed to the treatment and two more because the patient was apprehensive about habituation. For only four medicines was forgetfulness given as a reason for error.

From interview assessment alone, compliance index (a) was between 90 and 110 per cent inclusive; that is, not more than 10 per cent deviation from absolute adherence, for 141 (73 per cent) of 194 medicines taken regularly.

(b) *Tablet count.* It was possible to make a reliable tablet count for 152 separate medicines taken regularly by 70 patients. The remaining medicines either could not be assessed (for example, unknown quantity supplied, excessive backlog, failure to renew prescription in time) or were not included because the denominator for the tablet count was too small (< 10 tablets) for the count to be reliable. The frequency distribution of compliance index (b) (Figure 1) is unimodal but skewed. Indices were between 90 and 110 per cent inclusive for only 71 medicines (47 per cent), less than 90 per cent for 69 (45 per cent), and greater than 110 per cent for 12

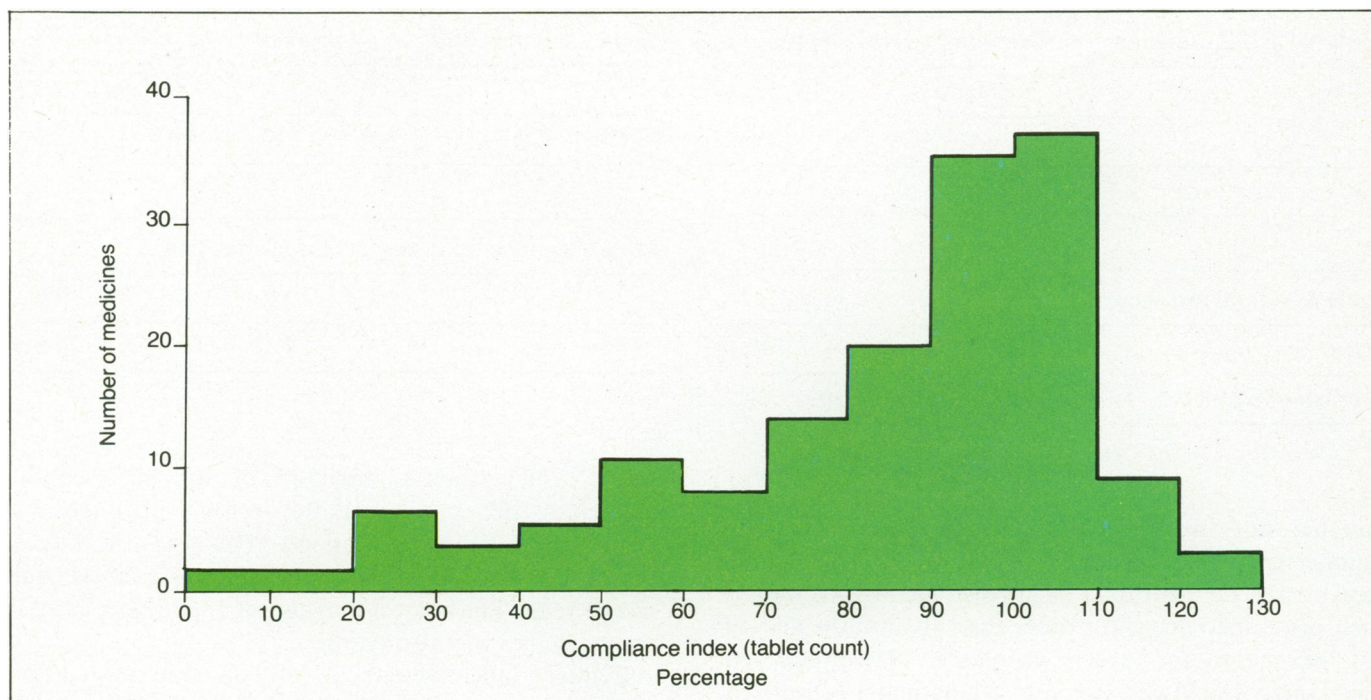


Figure 1. Frequency distribution of compliance index from tablet counts, using individual medicines as units.

(eight per cent). Using these arbitrary divisions, it was possible to assess the relationship between compliance and other independent variables by chi-squared (χ^2) analysis. Deviation by more than 10 per cent from absolute adherence was more common where medicines were taken by women ($\chi^2 = 8.3$; $p < 0.005$) than when men were the recipients. The same was true for medicines taken several times each day ($\chi^2 = 4.48$; $p < 0.05$) when compared with medicines taken only once daily.

There was no significant relationship between compliance index (b) and age, MTS, social class, marital status, living alone, assistance with tablet taking, or duration since last contact with family doctor. Use of memory aids made no difference to the tablet count compliance index.

Tablet counts were compared with interview assessment of compliance for 152 medicines. There was a highly significant correlation between the compliance

indices obtained by the two methods ($r_s = 0.45$; $p < 0.001$). Table 7 reveals how far individual values agreed and shows that errors identified by interview are highly likely to be 'confirmed' by tablet count.

(c) *Prescription record.* Sufficient information was available on the prescription record cards to calculate compliance index (c) for 168 medicines taken regularly by 71 patients. Indices were between 90 and 110 per cent inclusive for 67 medicines (40 per cent), less than 90 per cent for 81 (48 per cent), and more than 110 per cent for 20 (12 per cent).

Compliance indices (b) and (c) were both available for 129 medicines taken by 59 patients and the correlation between them (Figure 2) was highly significant ($r_s = 0.68$, $p < 0.001$).

In practical terms, it is the accuracy of the compliance index predicted from prescription records which determines the usefulness of this approach and Table 8 reveals the likelihood of a correct prediction. Poor compliance was correctly predicted in two thirds of all instances. For those medicines where interview assessment suggested good compliance but tablet count showed otherwise, the prescription record agreed with the tablet count on 32 out of 50 occasions.

The overall correlation between compliance indices (a) and (c) was highly significant ($r_s = 0.47$, $p < 0.001$). Moreover, where poor compliance was suggested by both indices, 'confirmation' by tablet count was highly likely (Table 9).

We also examined the prescription records of those 50 patients not interviewed at home. Records were adequate for 32 patients (64 per cent) who were taking a

Table 7. Confirmation by tablet count of predictions of compliance made from interview assessment alone. Percentages are given in brackets.

		Tablet count		
		90 to 110	<90 or >110	Total
Interview assessment	90 to 110	67 (58)	49	116
	<90 or >110	4	32 (89)	36
Total		71	81	152

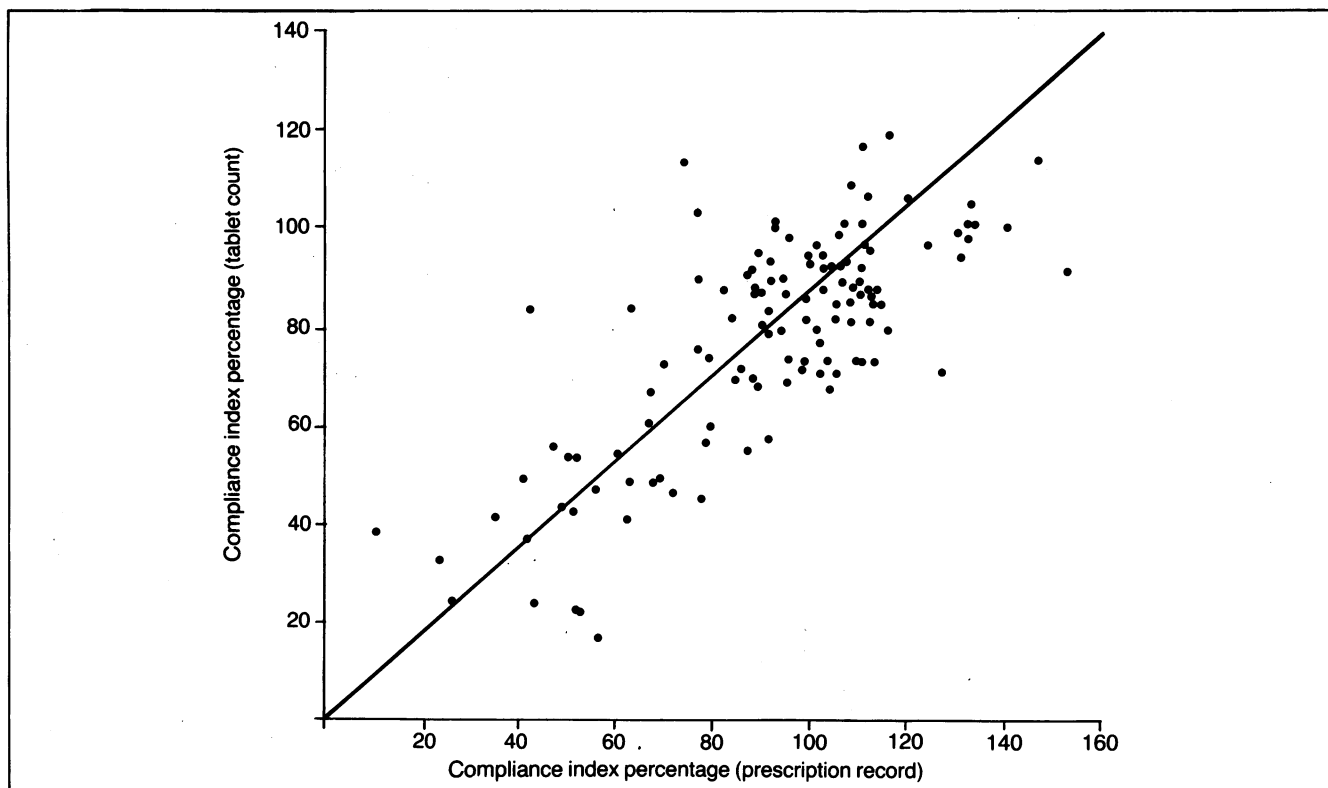


Figure 2. Regression of compliance index from tablet counts against compliance index predicted from prescription records. Diagonal line represents unity.

total of 78 medicines. Compliance index (c) was between 90 and 110 per cent inclusive for 23 medicines (30 per cent), less than 90 per cent for 44 (56 per cent), and more than 110 per cent for 11 (14 per cent). The distribution of indices between the three categories did not differ significantly from that found among those patients who were visited at home ($\chi^2 = 5.31; 0.1 > p > 0.05$).

Discussion

The 81 patients who were interviewed at home may not have been representative of the 131 elderly taking regular medicines in this practice. Those who could not be found at home on three occasions were not interviewed and this inevitably led to some bias in patient selection. However, those not interviewed did not differ significantly from the main study group in age and sex distribution or in the average number of medicines taken. The similarity in the distribution of compliance indices assessed from prescription records also suggests that these patients belong to the same population sample.

It was not customary for these patients to have regular appointments with their family doctor. No contact was made until tablet supplies were almost exhausted, when a repeat prescription was requested and collected either by the patient or by a friend or relative. The majority of patients had been taking medicines regularly for more than six months and most

took them unsupervised. Despite the fact that only one quarter of the bottle labels had clear instructions and many of these could not be read by the patients, the correct dosage regimen was known for 92 per cent and the correct purpose for 72 per cent of all medicines taken. Poor comprehension could not therefore be considered responsible for the compliance indices revealed by tablet counts.

Parkin and colleagues (1976) in a study of patients recently discharged from hospital have suggested that poor comprehension accounts for 70 per cent of errors in tablet taking. Our patients had had several months in which to become familiar with their treatment and this may account for the difference.

The apparent high level of compliance suggested by interview assessment was not borne out when this was

Table 8. Confirmation by tablet count of prediction of compliance made from prescription record alone. Percentages are given in brackets.

		Tablet count		
		90 to 110	<90 or >110	Total
Prescription record	90 to 110	34 (64)	19	53
	<90 or >110	26	50 (66)	76
Total		60	69	129

Table 9. Confirmation by tablet count of prediction of compliance made from both interview assessment and prescription record where these agreed. Percentages are given in brackets.

		Tablet count		
		90 to 110	<90 or >110	Total
Interview assessment and prescription record	90 to 110	34 (69)	15	49
	<90 or >110	3	19 (86)	22
Total		37	34	71

compared with the tablet counts. Patients tended to report absolute adherence when this was not the case and interview assessments were often misleading. When errors were admitted, however, poor compliance by tablet count was usual and for 65 per cent of all medicines the tablet count confirmed the interview prediction of compliance (index 90 to 110 per cent inclusive) or non-compliance.

Tablet counts revealed that patients were deviating by more than 10 per cent from the prescription for more than half of all medicines. This finding is at variance with previous studies of compliance in the community. Drury and his colleagues (1976) in a study of 521 patients (of whom 111 were aged over 60) found that 90 per cent of patients deviated by less than 10 per cent from instructions regarding drug dosage and that there was no relationship between compliance and age. This discrepancy may result from patient selection. In addition, our patients had been receiving regular repeat prescriptions for several months before the study and 33 had not seen a doctor for at least three months. By contrast, fewer than half of the patients studied by Drury and colleagues (1976) had been having regular treatment for any length of time and only one fifth were issued repeat prescriptions without seeing the doctor. It is recognized (Haynes, 1976) that regular contact with the doctor improves compliance and this may be a further explanation for our findings.

The observation that men comply better than women was unexpected. Although a few previous studies have drawn a similar conclusion (Haynes, 1976), the majority have found no relationship between compliance and sex. The association between poor compliance and an increased number of daily doses of medicine supports the findings of Gatley (1968).

The correlation between compliance indices calculated from prescription records with those obtained by tablet count reveals a further use for this particular form of data base. The compliance index for almost two thirds of all medicines was predicted simply by keeping an accurate record of all tablets issued. Moreover, concurrent use of prescription records and

interview assessment increased the accuracy of this prediction to 86 per cent. The use of cumulative totals in the prescription record would enable an assessment of compliance to be made at regular intervals.

We also attempted to evaluate the potential importance of poor compliance in these patients. Potassium chloride tablets were most commonly omitted although the number of patients involved was small. A total of 18 errors of omission of tablets were considered potentially dangerous: all could have been detected either by interview assessment or from the prescription records. Adverse effects could also have resulted from three medicines which were being taken in excess: two of these errors were evident from the prescription records.

Having obtained a prediction of the compliance index, what action should be taken when a patient is found to be complying poorly with one or more of his medicines? The use of the medicine should be questioned and the overall regimen simplified, if possible, with respect to the number of drugs and doses. Comprehension of the treatment regimen should be assessed and appropriate explanation given. Evidence of failing memory may indicate the need for supervision of tablet taking or the provision of written memory aids.

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