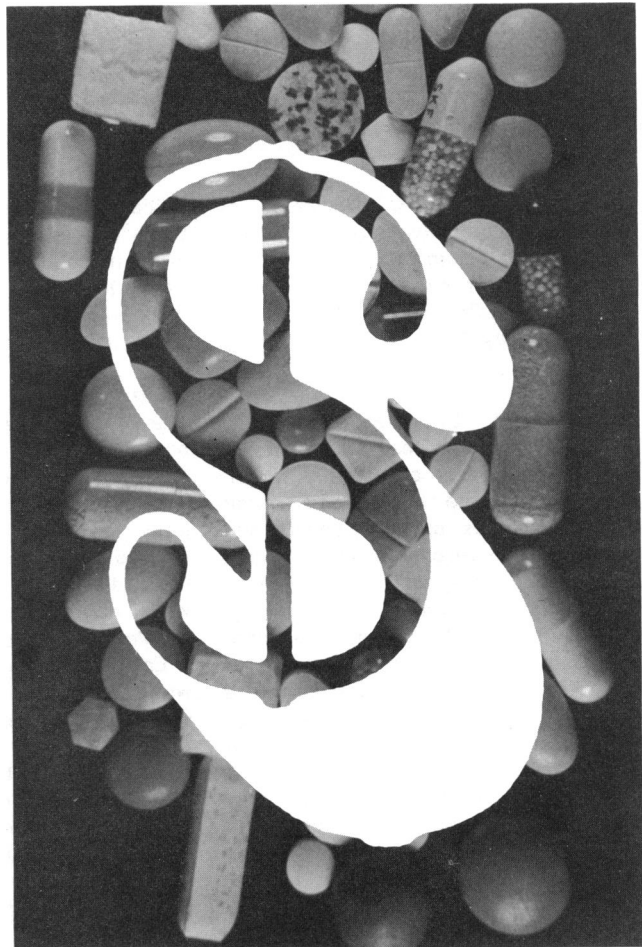# Effect of Economic Barriers to Medical Care on Patients' Noncompliance

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RISING DRUG PRICES have created serious financial difficulties for every country whose national health program includes drug benefits. Seeking to overcome these difficulties, some countries have placed restrictions on free drugs and begun charging for prescriptions. Many patients, not being able to afford the drugs, then are forced to discontinue treatment that their physicians have suggested. This problem and reasons for the ambulatory patient's failure to com-

ply with physician instructions have been discussed in a previous paper (1). In the current paper, we focus on the relationship between patients' compliance and their fiscal ability to purchase drugs. In addition, the effects that the amount of drugs prescribed and the frequency of dosage have on compliance with physicians' instructions are specifically examined.

Method

The study group comprised 290 patients who were discharged consecutively over a 3-month period from the inpatient medical services of Victoria General Hospital in Halifax, Canada. The selection of these patients and their grouping by diagnosis and functional capacity have been described elsewhere (1).

Trained interviewers visited the patients 6 months after their discharge from the hospital to obtain information on the outcome of medical care and their compliance with the advice given at the time of discharge by the attending physicians. These physicians also were interviewed to verify the accuracy of the patients' versions of their advice.

On the basis of the interview data, each patient was then carefully appraised. This appraisal included a reconstruction of events since the patient's discharge as well as a determination of the extent of compliance with the physician's orders and the reasons for any noncompliance. Patients who had carried out all of the physician's instructions (self-administered their medication, kept their appointments, attended outpatient clinics, visited family practitioners' offices or other health facilities, and so forth) were categorized as compliers; patients who had not carried out instructions were categorized as noncompliers.

To gain a better understanding of the complex problem of noncompliance, we also examined how prescription load (number of drug prescriptions) and dosage affected patients' compliance with physicians' instructions. Information supplied by the physician (names of drugs, amounts prescribed, and daily dosage) was compared with corresponding information that the patient had obtained by observing the labels on bottles in which the drugs were dispensed.

From a list of the drugs prescribed for each patient, we estimated the cost per 100 tablets, based on hospital pharmacy's purchase price (which on the average was lower than that in city drug stores). The chi-square test of significance was used in comparing the patients who had complied with all the physicians' instructions and those who had not. Discriminant function analysis (multivariate analysis for describing group differences) was also done. Discriminant function analysis can be regarded as a multiple linear regression of Y (a dependent variable) on the independent variables tested in this study—age, education, and economic status. The variable of age did not supply sufficient information to be included in the discriminant function. Use of this linear discriminant function makes misclassification of a patient as compliant or noncompliant less probable.

Results

Of the 290 patients in the study population discharged alive from the hospital, 33 (14.7 percent) died before the followup interview, 12 (5.1 percent) refused to be interviewed, 13 (5.3 percent) had moved out of the city or could not be located, and 7 (3.1 percent) were too ill to answer questions. Selected characteristics of the other 225 patients, who were followed for 6 months after discharge, are given in table 1. The study group was about equally divided between men and women, and both sexes were similar in age, education, and family income. The spouses of more women then men, however, had died, and more women than men were severely ill.

Ninety-one of the 225 patients who were interviewed had not complied with one or more of the

Table 1. Selected characteristics of patients by sex

Characteristic	Men	Women	Both sexes	
			Number	Percent
Total patients	113	112	225	100.0
Average age, education, income:				
Age (years)	59.2	58.1	57.0	...
Education (years) [1] ...	8.7	8.1	8.4	...
Family income (annual).	$6,066	$5,973	$6,020	...
Marital status: [2]				
Single	13	5	18	8.0
Divorced	7	9	18	7.1
Widowed	16	43	59	26.2
Married	77	54	131	58.2
Severity of disease: [3]				
Severe	18	29	47	16.9
Moderate	33	38	71	27.1
Mild	62	45	107	56.0

[1] Information on education is for 112 men and 111 women or a total of 223.
[2] Unknown for 1 patient. Percentages do not add to 100.0 because of rounding.
[3] Severe—functional capacity IV or V; moderate—functional capacity III; mild—functional capacity II or III.

physician orders (table 2). The proportion of women not complying was slightly larger than the proportion of men, but the difference was not statistically significant. The youngest and the oldest groups had the highest proportion of noncompliers—50.0 percent in the group 30–39 years and 62.5 percent in the group

80 years and over, although again the difference was not statistically significant. Analysis of noncompliance by marital status showed that the single and the widowed had the highest proportions of noncompliers—55.5 percent in the single group and 52.5 percent in the widowed, while the divorced and the married had lower proportions—37.5 percent among the divorced and 34.4 percent among the married. The differences in compliance between the four marital status groups were significant.

Education apparently affected compliance (table 2). Patients with 0–6 years of education complied less than those with the highest level of education. This difference may have been due in part to age. A similar result was obtained when compliers and noncompliers were compared according to income. The proportion of noncompliers increased as yearly income decreased, and vice versa; this association was significant.

According to the multiple discriminant function analysis, Y equals minus 0.03283, which is the discriminant score. The average discriminant score was 0.24 for the 134 compliers and minus 0.35 for the 91 noncompliers. Of the 134 patients who were actually compliant, 98 (73 percent) were classified as compliers by discriminant analysis. Of the 91 patients who were actually noncompliant, 53 (58 percent) were classified by the analysis as noncompliant. The analysis classified 67 percent of the 225 patients correctly.

To study the reasons for noncompliance, patients were categorized by their primary reason for not complying (table 3). The most frequently cited reasons were cost of drugs (31 patients), patient's atti-

Table 2. Proportions of noncompliers by age, sex, education, income, marital status, and severity of condition

Characteristic	Patients interviewed	Noncompliers	
		Number	Percent
Total	225	91	40.4
Age (years):			
30–39	24	12	50.0
40–49	30	8	26.6
50–59	60	19	31.6
60–69	52	22	42.3
70–79	43	20	46.5
80 and over	16	10	62.5
$\chi^2 = 8.62$, N.S.			
Sex:			
Male	113	43	
Female	112	48	
$\chi^2 = 0.54$, N.S.			
Education (years):[1]			
0–6	60	37	61.6
7–10	145	49	33.7
11 and over	18	4	27.8
$\chi^2 = 16.3$, $P < 0.001$.			
Marital status:[2]			
Single	18	10	55.5
Widowed	59	31	52.5
Divorced	16	5	37.5
Married	131	45	34.4
$\chi^2 = 7.88$, $P > 0.05$.			
Income (annual):			
$3,000	57	31	54.3
$3,000–$6,999	86	38	44.1
$7,000–$10,999	62	19	30.6
$11,000 and over	20	3	10.5
$\chi^2 = 12.9$, $P < 0.001$.			
Severity of disease:[3]			
Severe	47	28	59.6
Moderate	71	32	45.0
Mild	107	31	28.9
$\chi^2 = 10.8$, $P < 0.001$.			

[1] Unknown for 2 patients.
[2] Unknown for 1 patient.
[3] See footnote 3, table 1.
NOTE: N.S.—not significant.

Table 3. Distribution of noncompliers by reason for noncompliance and sex

Reason	Men	Women	Both sexes	
			Number	Percent
Total	43	48	91	100.0
Cost of drugs	16	15	31	34.0
Patient's attitude	6	10	16	17.6
Patient's misunderstanding of advice	8	7	15	16.5
Negligence, senility, or alcoholism	8	7	15	16.5
Community services not received	3	4	7	7.6
No reason given	2	3	5	5.5
Failure of referral	0	2	2	2.2

Table 4. Relationship of prescription load to patients' compliance with physicians' orders

Prescriptions per patient	Compliers [1]	Noncompliers
Total	119	80
1	44	15
2	35	13
3	18	23
4	13	18
5 or more	9	11

[1] Patients who took prescribed drugs faithfully although they may not have complied with all other advice.
NOTE: $\chi^2 = 18.85$, df = 4, $P<0.001$.

Table 5. Relationship of dosage prescribed to patients' compliance with physicians' orders

Dosage	Compliers [1]	Noncompliers
Total	119	80
As needed	11	2
Once a day	34	10
Twice a day	20	6
3 times a day	26	26
4 times a day	28	36

[1] Patients who took prescribed drugs faithfully although they may not have complied with all other advice.
NOTE: $\chi^2 = 21.28$, df = 4, $P<0.001$.

Table 6. Drug prescription loads of compliant patients and of noncompliers unable to afford drugs

Prescriptions per patient	Compliers	Noncompliers
Total	168	31
1	52	7
2	43	6
3	34	7
4	27	4
5 or more	12	8

NOTE: $\chi^2 = 10.94$, df = 4, $P<0.02$.

Table 7. Relationship of prescription load and cost of drugs to patients' compliance with physicians' orders

Prescription load and cost of drugs [1]	Compliers	Noncompliers	Both groups Number	Both groups Percent
Low load				
Cost below average	71	15	86	43.2
Cost above average	8	13	21	10.6
High load				
Cost below average	31	14	45	22.6
Cost above average	9	38	47	23.6
Total	119	80	199	100.0

[1] Low prescription load, 1–2 prescriptions; high load, 3 or more. Cutoff for cost of drugs was the $9 average monthly expense of drugs for total study group—below average, less than $9; above average $9 or more.
NOTE: $\chi^2 = 21.75$, df = 3, $P < 0.001$.

Table 8. Relationship of dosage prescribed and cost of drugs to patients' compliance with physicians' orders

Dosage and drug cost	Compliers	Noncompliers	Both groups Number	Both groups Percent
Low dosage [1]				
Cost below average	62	11	73	36.7
Cost above average	3	7	10	5.0
High dosage [2]				
Cost below average	33	9	42	21.1
Cost above average	21	53	74	37.2
Total	119	80	199	100.0

[1] Once or twice per day.   [2] 3 or more times per day.
NOTE: $\chi^2 = 46.3$, df = 3, $P < 0.001$.

tude (16 patients), misunderstanding of physician's advice (15 patients), in that order. A significant component of noncompliance was the lack of adequate communication or understanding between hospital physicians, community health agencies, and patients.

A comparison of compliers with noncompliers in respect to the number of prescriptions per patient indicated an association between the size of a patient's prescription load and the patient's compliance (table 4). A heavy prescription load apparently reduced compliance. The difference in prescription loads between the compliers and noncompliers was significant. The result also was similar when compliers and noncompliers were compared according to the amount of their dosage (table 5).

Of the 199 patients who received drug prescriptions from their physicians, 31 did not comply with the physician's instructions, the reason given in all instances being financial limitations (table 6). The difference in prescription load between the group that took the prescribed drugs faithfully and the

group that did not was significant ($x^2 = 10.94$, df $= 4$, $P < 0.02$). The combined effects on compliance of the independent variables of prescription load and cost of drugs are shown in table 7. Table 8 shows the combined effects on compliance of the variables of daily dosage and cost of drugs. These results suggest that prescription load, or dosage, when combined with the cost of drugs, can have a marked effect on compliance with a physician's orders; it is the added financial burden imposed by drug costs that brings about the more pronounced effect.

The average monthly cost of drugs prescribed for the patients who did not comply with their physicians' instructions was almost three times higher than the cost for the patients who complied—$14.65 compared with $5.16 (table 9). The highest drug expenses were reported by a selected group of patients in this study with diseases of the circulatory system, followed by the costs reported by patients with diabetes; the lowest financial outlay was reported by patients with rheumatoid arthritis. Since cancer patients were treated primarily by radiation, the cost of their drugs was minimal, and the disease is not included in table 9.

Discussion

The number of factors that may account for variations in patients' compliance with physicians' orders is enormous. A review of the medical literature reveals that the proportion of noncompliant patients ranges from 15 to 90 percent. This wide range reflects variations in patient populations, definitions of compliance, methods of data collection, and medical conditions under investigation. The literature on compliance is not in agreement on the attributes of noncompliant patients. Forty-two percent of the physicians interviewed in a study by Davis (2) stated that age, sex, education, and socioeconomic status made no difference in their patients' compliance with instructions.

In contrast, in most empirical surveys on compliance, including ours, age differences have been observed. A sex difference also has been shown (3, 4). Researchers seeking an association between compliance and socioeconomic status have reported that higher education is related to compliance (5). The less educated patient may not consider his symptoms serious enough to require treatment, or he may have such an independent attitude that he resists medical treatment (6). A patient whose education and economic status cause him to be unhappy may express his discontent by breaking off his medical care. If we are to deal effectively with noncompliant attitudes,

we undoubtedly must do more than disseminate facts to the public. It will also be advisable to inform physicians of the necessity of explaining more carefully to their patients how to carry out their instructions and how the treatment can help them. In addition, organized home care programs, of which there are now too few, would permit health care providers to deal directly with some of the factors leading to noncompliance and to reduce it.

There is evidence that the severity of a patient's disease is a factor in compliance. Ambuel and associates reported that patients with long-term illnesses and a severe disability who had help available to them in the home were more likely to comply with medical recommendations than those with less severe disabilities (7). In our study, however, it was the patients with the less severe illnesses who complied better with physicians' orders. As noted before, compliance depends on many factors, and severity of disease per se does not determine whether or not a patient will follow the physician's advice. Poverty, discontent, fears about a disease, and doubts about the value of a recommended treatment (especially if the treatment is complex) can lead the patient to take a fatalistic attitude and stop treatment on his own initiative (8). In our study, the subjects with severe conditions were older, more often lived alone, and were less educated than the patients with milder conditions, and the large number of patients with those characteristics may help explain why the proportion of noncompliers was higher than in other studies.

Another reason for noncompliance that our analysis revealed was that the patient did not have sufficient understanding of the physician's instructions and of the treatment prescribed. When a physician fails to convey clearly the significance of a treatment, the patient is less likely to comply with the physician's recommendations (9). Although there is not complete agreement as to how the physician-patient relationship affects compliance, most investigators recognize the significance of adequate communication between them (10–12).

Jenkins (13) was probably the first in the 20th century to report on drug defaulting. Patients in his study took only half of their prescribed dosage. The noncompliance rates reported in several other studies have ranged from 17 per cent for a sample of 59 patients to 90 percent for a sample of 40.

Most investigators describing patients' compliance with oral recommendations for drug use agree that about half of the patients for whom drugs are prescribed do not take the drugs as prescribed (14–17).

Table 9. Relationship of cost of drugs prescribed for selected diseases to patients' compliance with physicians' orders

Diseases	Average monthly cost of drugs	
	Compliers (N = 119)	Noncompliers (N = 80)
Diseases of circulatory system (ICD 390–448)	$450.32	$698.92
Diseases of gastrointestinal tract (ICD 531–534)	23.34	91.27
Mental disorders (ICD 300–448)..	46.12	125.28
Rheumatoid arthritis (ICD 712.0–712.5)	31.18	49.42
Diabetes mellitus (ICD 250)	64.47	207.54
Total	$615.43	$1,172.43
Average cost per patient	$5.16	$14.65

In our study, 15.5 percent of the 199 patients for whom drugs were prescribed did not comply with instructions for their use. Thirty-one of the 91 non-compliers gave as their reason for noncompliance the high cost of drugs.

A fundamental question is: How accurate are estimates of patients' compliance that are based on indirect measures? Gordis and associates (18) sought to determine whether statements by patients or their relatives were valid enough measures of compliance that they could be used in drug trials and medical care research. These investigators estimated patients' compliance with physicians' orders for continuation of penicillin prophylaxis from the results of urine tests for penicillin and then compared the estimated use of the drug with the use revealed by the patient, his mother, or both, in interviews. They found considerable differences between the compliance indicated by the urine test and that reported by the patients or relatives (18). Urine testing affords an objective measure of penicillin consumption, but a quantitative measure of it is usually lacking. The presence of the drug in the urine is ascertainable, but the urine test fails to differentiate between overdosing and underdosing. An interview permits a more indepth study that can reveal the more subtle type of patient errors.

In comparing verbal reports of drug use with dosage unit counts, a discrepancy often exists, but it has been found that accuracy is not seriously jeopardized when noncompliance is extensive (19).

If a patient is to comply with the physician's directions for use of drugs, the patient must be able to comprehend and recall those directions (14, 20, 21). The physician, however, may fail to perceive the patient's level of understanding, and thus the physician's written description of the daily dosage and related information may not always be adequate. The dosage schedules themselves may affect the patient's ability to recall them. Our study showed that a patient was more likely to recall a once daily medication than one that was to be taken three or four times daily. Moreover, as the number of prescribed drugs increased, so did the percentage of noncompliance (table 5). It has been suggested that long-acting drugs might reduce some of the noncompliance assignable to the patient's forgetting to take his medicine (22).

Multiple prescriptions also may make it difficult for a patient to recall which drug to take at a given time (23). Here again our study revealed that the rate of noncompliance went up with an increase in the number of prescriptions (table 6).

In addition to the effect of the patient-physician relationship on compliance, there are behavioral influences that may influence compliance, such as the patient's belief in treatment or the patient's will to be treated.

Drug cost is a significant factor in compliance (tables 7–9) and one that is often neglected in accounting for patients' decisions. Of the patients in our study for whom drugs were prescribed, 15.5 percent said they were unable to pay for their medicines. These patients belonged to the minority of respondents who were ineligible for welfare benefits. Inability to pay for drugs prevents many patients from receiving the medical treatment prescribed for them. Especially affected are the elderly who are chronically ill and patients in the lower socioeconomic group, the group to which the majority of our study population belonged. These two groups also constitute the segment of the general population using the most health services and for whom the most drugs are prescribed. If these people cannot afford the drugs prescribed for them, the quality of their care obviously suffers.

To overcome the fiscal barrier to quality care, the following steps need to be taken:

1. Establish an effective public education program to reduce the abuse or unnecessary use of drugs (some of which is caused by unwarranted demands placed on physicians by patients and some by a tendency of some physicians to rely too heavily on drugs in their treatment and to overprescribe).

2. Increase the cooperation between physicians and pharmacists in the prescription of drugs.

3. Encourage physicians to examine their prescribing habits periodically. Some may not realize that their patients have difficulty coping with the high cost of the drugs they prescribe. Physicians may also fail to see that they sometimes put patients to unnecessary expense by prescribing drugs in too small quantities so that a number of refills are required. Improvement of the prescribing habits of physicians is a crucial element in achieving control over the cost of drugs.

4. Provide prescription drugs without charge to people over 60 years of age who are in need or institute a program to subsidize their purchase of prescribed drugs.

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SYNOPSIS

BRAND, FREDERICK N. (Boston University School of Medicine), SMITH, RICHARD T., and BRAND, PETER A.: *Economic barriers in medical care as a factor in patients' noncompliance. Public Health Reports, Vol. 91, January–February 1977, pp. 72–78.*

The post-hospital care of 290 patients with selected chronic conditions of a specific severity who were discharged over a 3-month period from a general hospital in Halifax, Canada, was studied. The majority of the patients were married. The average age of the men was 59.2 years and of the women 58.1. More than half of the patients belonged to the low socioeconomic group earning between $1,000 and $6,999 a year. Their average period of education was 8.4 years.

Interviews with the patients about their compliance with physicians' orders revealed that 40.4 percent had not complied with one or more of their physicians' recommendations. Lack of compliance was related to age, marital status, education, income, and severity of disease. It was also associated with high dosages of medicine and multiple prescriptions. Cost barriers constituted a significant factor in noncompliance.