

Predictors of Medication Noncompliance in a Sample of Older Adults

Stephen Joel Coons, Ph.D.,¹ Sharon L. Sheahan, Ph.D.,² Steven S. Martin, M.S.,¹ Jon Hendricks, Ph.D.,⁴ Cynthia A. Robbins, Ph.D.,³ and Jeffrey A. Johnson⁵

¹Center for Pharmaceutical Economics, College of Pharmacy, The University of Arizona, Tucson, Arizona. ²College of Nursing, University of Kentucky, Lexington, Kentucky. ³Center for Drug and Alcohol Studies, Department of Sociology and Criminal Justice, University of Delaware, Newark, Delaware. ⁴Department of Sociology, Oregon State University, Corvallis, Oregon, and ⁵College of Pharmacy, The University of Arizona, Tucson, Arizona

ABSTRACT

The subjects were 1028 respondents from a randomly selected sample of independently living adults aged 55 years and older in the southeastern United States. Data on background characteristics, physical health, life satisfaction, psychological distress, and medication compliance were gathered from structured interviews. Among the 785 subjects in the analysis who were taking prescribed medications, 75% were women, 83% were white, their median income was \$12,500 annually, 66% lived alone, their mean age was 73.9 years, and their mean number of years of education was 11.4. Twenty-one percent of all respondents taking medications had been noncompliant during the month preceding the study interview. Noncompliance with prescribed medications was significantly associ-

ated with higher socioeconomic status ($P < 0.01$), greater number of prescribed medications ($P < 0.01$), and higher psychological stress ($P < 0.05$). There was no relationship between compliance and living arrangements, health, life satisfaction, number of illnesses, age, or sex.

INTRODUCTION

An enormous number of safe and effective medications have been introduced into the medical market over the past several decades, and many have become mainstays in the management of a variety of conditions.

Feldstein¹ wrote that "Drugs provide society with enormous benefits. They reduce mortality and morbidity, relieve pain and suffering, are less expensive forms of treatment than surgery and hospitalization, are more readily accessible to a larger portion of

the population than are more expensive technologies, and have enabled physicians to see more patients with improved treatment outcomes." Nevertheless, the use of medications can be a double-edged sword. When used appropriately, they can be one of the least expensive and most cost-effective components of health care.² But when used inappropriately, resources are wasted, little or no therapeutic benefit is achieved, and health may be endangered by delay in effective treatment.

Compliance has been defined as the extent to which a person's behavior coincides with medical or health advice.³ The terms compliance and noncompliance are used in this article and are considered equivalent to the terms adherence and nonadherence as used by others.⁴

The extent of noncompliance with recommended health behaviors varies considerably. Sackett and Snow⁵ reported that compliance rates range from 10% to 94% for various health recommendations. Because of the high incidence of noncompliance, the problem has stimulated a large body of literature, which, according to Blackwell,⁶ doubles every 5 years. This prompted Becker and Maiman⁷ to note that patient compliance has become the best documented, but least understood, health behavior.

In terms of drug regimens, compliance means taking the correct dose of a medication at the proper interval for the appropriate period of time. Medication taking is an extremely complex human behavior, which, as with many behaviors, is influenced by a variety of factors. Much research has been conducted in efforts to identify the factors that influence treatment compliance⁸⁻¹⁰ and methods of improving noncompliant behavior.^{10,11}

THE COSTS OF NONCOMPLIANCE

Failure to adhere to therapeutic regimens is recognized as a major obstacle to obtaining quality medical care.¹² The impact of compliance on health outcomes, in addition to survival and other traditional biomedical goals, also needs to be measured.¹³ Interest in improving health outcome assessment is increasing as a result of the need to balance the costs and benefits of various health care technologies. An example of an unacceptable health outcome is admission to a hospital or nursing home resulting from noncompliance with treatment regimens.

The incidence of such unacceptable health outcomes may be substantial. Maronde et al¹⁴ found that noncompliance with an antihypertensive drug regimen increased the hospitalization rate at an acute care hospital. A recent meta-analysis of relevant studies by Sullivan et al¹⁵ showed that an average of 5.3% of hospital admissions were related to medication noncompliance at a cost of more than \$8 billion in direct hospitalization costs in 1986. When indirect costs are included, the estimates of total expenditures resulting from noncompliance have ranged from \$25 billion¹⁵ to greater than \$100 billion.¹⁶

Noncompliance with appropriately prescribed drug regimens can also lead to premature death. Compliance for some postmyocardial infarction patients in the Beta Blocker Heart Attack Trial¹⁷ was literally a matter of life or death: poor compliers were 2.6 times more likely than good compliers to die within a year of follow-up. An interesting aspect of the findings was that poor compliers had an increased risk of death whether they were receiving the

active drug or placebo. In a follow-up study¹⁸ of the effect of compliance among patients with hematologic malignancies, compliance with oral medication significantly improved patient survival.

COMPLIANCE AND OLDER PATIENTS

Compliance rates among patients 60 years of age and older range from 26% to 59%.¹⁹⁻²² These rates are similar to those found in younger populations.^{5,10,23,24} However, comparison of these rates is difficult because measurements and definitions of compliance differ from study to study.

No direct relationship between a person's age and the degree of compliance to treatment regimens has been found.^{9,25} However, many factors that change as a patient ages may have a negative impact on the level of compliance. For example, older adults tend to have more chronic diseases and therefore a greater number of medications; they may have more difficulty understanding and processing medical advice given to them; they are less likely to question advice and tend to be less active in their self-care, relying more on the provider; and they are more vulnerable to the physical, social, and psychological consequences of noncompliance.^{19,25,26} Fedder²⁷ has developed an index of risk for noncompliance in elderly patients; the items include age greater than 75 years, female sex, lower socioeconomic status, living alone, lack of a support system, multiple drugs and complicated regimens, and multiple disease pathology.

Col et al¹⁹ studied 315 consecutive admissions of elderly persons to an acute care hospital during a 3-month

period in 1987 and found that 17% were related to adverse drug reactions and 11% to noncompliance. Some of the factors found to be associated with a higher risk of hospitalization due to noncompliance were poor recall of drug regimen, seeing numerous physicians, use of numerous drugs, and having the opinion that drugs are expensive. The total hospital cost for the 36 noncompliance-related admissions was \$77,289, or approximately \$2150 per admission. A history of noncompliance during the year before admission was reported by 33% of the 315 patients. Higher monthly medication costs and lack of insurance coverage for medications were significantly associated with a history of noncompliance.

The purpose of the present study was to identify possible predictors of patient compliance with treatment regimens in older adults.

SUBJECTS AND METHODS

The subjects were a randomly selected sample of independently living adults age 55 and older in a medium-sized southeastern US city. They participated in a 1-hour structured interview conducted by professional interviewers in the participant's home. The interview instrument included demographic, psychosocial, and health-related items and detailed questions on medication use and compliance with prescribed medications. Noncompliance was defined as taking medications more or less often than prescribed in the month preceding the interview. Nonjudgmental questions about treatment compliance were asked, an approach that has been effective in prior research.²⁸ The two questions were as follows:

1. Some people find it necessary to take drugs *more* often or *less* often

than their prescriptions suggest. In the past month, have you found yourself taking a medication *more* often than is prescribed? (Yes or No.)

2. In the past month, have you taken a medication *less* often than prescribed? (Yes or No.)

Data Analysis

A logistic regression model²⁹ was developed to assess the impact of several factors on compliance. Variables entered into the model include age, sex, number of medications, number of

illnesses, whether or not the respondent lived alone, and self-reports of physical health, life satisfaction, and psychological distress. Physical health was reported on a four-point scale from 1 = poor to 4 = excellent; life satisfaction was recorded on a three-point scale from 1 = poor to 3 = good. Psychological distress was assessed using a previously validated 12-item schedule³⁰ that was part of the interview instrument. A composite variable of socioeconomic status incorporated income and level of education and was standardized

Table I. Characteristics of the 785 subjects who were taking prescribed medications who had data available for analysis.

Sex (%)		Physical health (% self-reported)	
Women	75	Poor	7.8
Men	25	Fair	27.0
		Good	50.8
		Excellent	14.4
Age (yr)			
Mean \pm SD	73.9 \pm 9.3		
Range	55-101		
Race (%)		Life satisfaction (% self-reported)	
White	83	Poor	5.2
Black	17	Fair	25.4
		Good	69.4
Annual income (\$)		Psychological distress score	
Median	12,500	Mean \pm SD	2.9 \pm 2.5
Range	<1000->40,000	Median	2.0
		Range	0-12
Live alone (%)	66	No. of prescribed medications in past year	
		Mean \pm SD	3.7 \pm 2.5
		Range	1-21
Education (yr)			
Mean \pm SD	11.4 \pm 3.8		
Range	<2->18		

to a z-score. Statistical analysis was performed using the SPSS (Release 4.1) statistical package (SPSS Inc., Chicago, Illinois). An a priori level of $P < 0.05$ was used to evaluate the significance of the coefficients within the logistic regression model.

RESULTS

The interview was completed by 1028 eligible subjects, representing a response rate of 85%. Prescribed medications were being taken by 843 subjects. Among the 843 subjects taking at least one prescribed medication, 21% had been noncompliant in the prior month.

Complete data on 785 of the 843 were available for further analysis. The characteristics of the 785 subjects taking medication are shown in Table I. Their mean age was 73.9 years, 83% were white, 75% were women, 66% lived alone, and they had a median annual income of \$12,500.

Noncompliance was significantly associated with three factors: higher socioeconomic status, a greater number of prescribed medications, and higher psychological distress scores (Table II). Compliance was not associated

with living arrangements (alone or with others), physical health, self-reported life satisfaction, number of illnesses, age, or sex.

DISCUSSION

The results of the regression analysis indicate that the number of medications alone, independent of the number of illnesses or self-perceived physical health, significantly predicted whether older adults in this study complied with prescribed medications. This finding has been reported by others.^{27,31} An association of noncompliance with an increased number of medical illnesses has been reported by some authors²⁷ but not by others.²¹ Perhaps more important than the number of medical illnesses is the nature of the diseases and the extent to which they interfere with daily activities.

The older adults in the present study were generally in good health, with 65.2% indicating they perceived themselves to be in good-to-excellent physical health. The overall rate of noncompliance in this sample of older adults is slightly lower than previously reported.¹⁹⁻²² It is likely that a sample

Table II. Logistic regression variables as predictors of noncompliance.

	β	P
Socioeconomic status	-0.3703	0.0011
No. of medications	-0.0925	0.0084
Psychological distress	-0.1162	0.0115
Living alone	-0.0612	0.7831
Physical health	0.0280	0.8386
Life satisfaction	-0.0530	0.7657
No. of illnesses	0.0005	0.9749
Age	0.0160	0.1199
Female	-0.1322	0.5667

of older adults with a greater proportion in poor physical health would have a lower compliance rate. The inverse relationship between compliance and psychological well-being was not unexpected: many psychological factors have been associated with non-compliance.^{32,33}

The relationship demonstrated between compliance and socioeconomic status is more difficult to interpret. Fedder²⁷ has suggested that the marginally poor and those who perceived they had poor economic security were at increased risk of noncompliance and required particular attention of the health care providers.²⁷ This relationship has been confirmed by other investigators.^{18,19,33-35} In the study by Cooper et al.,²⁰ however, only 6% of noncompliant elderly subjects indicated that the drug was not available or could not be afforded, and no difference was found in incomes of compliers and noncompliers. One possible explanation for the present results is that the subjects of lower socioeconomic status placed more value on medical care and were thus more likely to follow the directions provided to them.

The mean age of nearly 74 years in the present sample would meet the age criteria of Fedder's risk index.²⁷ The results of the regression analysis, however, indicated that age was not a predictor of medication compliance.

The results of this study provide a profile of predictors of noncompliance in a sample of older adults. Noncompliance was more likely among subjects with more prescribed medications to take and in those of higher socioeconomic status and lower psychological well-being. An awareness of factors

associated with noncompliance can enable health care providers to target more extensive compliance-enhancing counseling for their older patients most at risk of compliance-related problems.

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Address correspondence to: Stephen J. Coons, Ph.D., Center for Pharmaceutical Economics, College of Pharmacy, The University of Arizona, Tucson, AZ 85721.

REFERENCES

1. Feldstein PJ. *Health care economics*. 3rd ed. New York: Wiley & Sons, 1988:437.
2. Abdella FG, Moore SR, eds. *Surgeon general's workshop on health promotion and aging: Proceedings*. Washington, DC: US Department of Health and Human Services, 1988.
3. Haynes RB. Introduction. In: Haynes RB, Taylor DW, Sackett DL, eds. *Compliance in health care*. Baltimore: Johns Hopkins, 1979:1-7.
4. Meichenbaum D, Turk DC. *Facilitating treatment adherence. A practitioner's guidebook*. New York: Plenum Press, 1987.
5. Sackett DL, Snow JC. The magnitude of compliance and noncompliance. In: Haynes RB, Taylor DW, Sackett DL, eds. *Compliance in health care*. Baltimore: Johns Hopkins, 1979:11-22.
6. Blackwell B. Treatment adherence. *Br J Psychiatry* 1976; 129:513-531.

7. Becker MH, Maiman LA. Sociobehavioral determinants of compliance with health and medical care recommendations. *Med Care* 1975; 13:10-24.
8. Sackett DL, Haynes RB. Compliance with therapeutic regimens. In: Wertheimer AI, Bush PJ, eds. *Perspectives on medicines in society*. Hamilton, IL: Drug Intelligence Publications, 1977:335-357.
9. Haynes RB, Taylor DW, Sackett DL, eds. *Compliance in health care*. Baltimore: Johns Hopkins, 1979.
10. Bond WS, Hussar DA. Detection methods and strategies for improving medication compliance. *Am J Hosp Pharm* 1991; 48:1978-1988.
11. Sclar DA. Improving medication compliance: A review of selected issues. *Clin Ther* 1991; 13:436-440.
12. Kaplan RM, Simon HJ. Compliance in medical care: Reconsideration of self-predictions. *Ann Behav Med* 1990; 12:66-71.
13. Ware JE. The assessment of health status. In: Aiken LH, Mechanic D, eds. *Applications of social science to clinical medicine and health policy*. New Brunswick, NJ: Rutgers University Press, 1986:204-228.
14. Maronde RF, Chan LS, Larson FJ, et al. Underutilization of antihypertensive drugs and associated hospitalization. *Med Care* 1989; 27:1159-1166.
15. Sullivan SD, Kreling DH, Hazlet TK. Non-compliance with medication regimens and subsequent hospitalizations: A literature analysis and cost of hospitalization estimate. *J Res Pharm Econ* 1990; 2:19-33.
16. Emerging issues in pharmaceutical cost containment (Newsletter). Reston, VA: National Pharmaceutical Council, 1992: 2:1-16.
17. Horwitz RI, Viscoli CM, Berkman L, et al. Treatment adherence and risk of death after a myocardial infarction. *Lancet* 1990; 336:542-545.
18. Richardson JL, Shelton DR, Krailo M, Levine AM. The effect of compliance with treatment on survival among patients with hematologic malignancies. *J Clin Oncol* 1990; 8:356-364.
19. Col N, Fanale JE, Kronholm P. The role of medication noncompliance and adverse drug reactions in hospitalization of the elderly. *Arch Intern Med* 1991; 150:841-845.
20. Cooper JK, Love DW, Raffoul PR. Intentional prescription nonadherence (noncompliance) by the elderly. *J Am Geriatr Soc* 1982; 30:329-333.
21. German PS, Klein LE, McPhee SJ, Smith CR. Knowledge of and compliance with drug regimens in the elderly. *J Am Geriatr Soc* 1982; 30:568-571.
22. Schwartz D, Wang M, Zeitz L, Goss MEW. Medication errors made by elderly, chronically ill patients. *Am J Public Health* 1962; 52:2018-2029.
23. Blackwell B. Patient compliance. *New Engl J Med* 1973; 289:249-252.
24. Eraker SA, Kirscht JP, Becker MD. Understanding and improving patient compliance. *Ann Intern Med* 1984; 100:258-268.
25. DiMatteo MR, Hays RD, Sherbourne CD. Adherence to cancer regimens: Implications for treating the older patient. *Oncology* 1992; 6:50-57.
26. Breemhaar B, Visser AP, Kleijnen JGVM. Perceptions and behaviour among elderly hospital patients: Descriptions and explanation of age differences in satisfaction, knowledge, emotions and behaviour. *Soc Sci Med* 1990; 31:1377-1385.

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27. Fedder DO. Drug use in the elderly: Issues of noncompliance. *Drug Intell Clin Pharm* 1984; 18:158-162.
28. Morisky DE, Green LW, Levine DM. Concurrent and predictive validity of a self-reported measure of medication adherence. *Med Care* 1986; 24:67-74.
29. Hosmer DW, Lemeshow S. *Applied logistic regression*. New York: Wiley & Sons, 1989.
30. Pfeiffer E. A short psychiatric evaluation schedule. Paper presented at the 28th Annual Meeting of the Gerontological Society of America, Louisville, Kentucky, October 1975.
31. Eisen SA, Miller DK, Woodward RS, et al. The effect of prescribed daily dose frequency on patient medication compliance. *Arch Intern Med* 1990; 150:1881-1884.
32. Morris LS, Schulz RM. Medication compliance: The patient's perspective. *Clin Ther* 1993; 15:593-606.
33. Dodrill CB, Batzel LW, Wilensky AJ, Yerby MS. The role of psychosocial and financial factors in medication noncompliance in epilepsy. *Int J Psychiatry Med* 1987; 17:143-154.
34. Boza RA, Milanes F, Salter V, et al. Patient noncompliance and overcompliance. *Postgrad Med* 1987; 81:163-170.
35. Chubon SJ. Personal descriptions of compliance by rural southern blacks: An exploratory study. *J Compliance Health Care* 1989; 4:23-38.