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Determinants of Cost-Related Nonadherence to Medications among Chronically Ill Patients in Maccabi Healthcare Services, Israel

Tzahit Simon-Tuval, PhD^{1,*}, Noa Triki, PhD², Gabriel Chodick, PhD^{2,3}, Dan Greenberg, PhD¹

¹Department of Health Systems Management, Guilford Glazer Faculty of Business and Management and Faculty of Health Sciences, Ben-Gurion University of the Negev, Beer-Sheva, Israel; ²Medical Division, Maccabi Healthcare Services, Tel-Aviv, Israel; ³Sackler Faculty of Medicine, Tel-Aviv University, Tel-Aviv, Israel

ABSTRACT

Background: The effectiveness of value-based insurance design is based on nonadherence, which derives solely from patients' economic constraints. **Objective:** Our objective was to examine the extent of cost-related nonadherence to chronic medications and to analyze its potential determinants. **Methods:** We conducted a telephone survey among a representative sample of Maccabi Healthcare Services chronically ill patients aged 55 years or older ($n = 522$). We developed a 12-month recall questionnaire that included demographic and socioeconomic characteristics, out-of-pocket expenditure on prescribed medication, physician's provision of explanation regarding prescribed therapy, adherence, and reasons for nonadherence. Respondents were defined as nonadherent if they reported that they did not purchase prescribed medications in the previous year because of their cost. We applied the multivariable logistic regression model to examine predictors of nonadherence. **Results:** Median (interquartile range) age of the study sample was 69 (13) years (53% males). One hundred sixty-five patients (31.6%) reported not purchasing prescribed medications mainly because of medications' adverse effects and/or cost. Fifty res-

pondents (9.6%) reported cost-related nonadherence. The multivariable logistic regression model revealed that cost-related nonadherence was associated with respondent's income lower than 4600 New Israeli shekel (odds ratio [OR] = 10.86; 95% confidence interval [CI] 1.45–81.12), unemployment (OR = 4.32; 95% CI 1.47–12.66), lack of physician explanation about the prescribed medication (OR = 2.38; 95% CI 1.18–4.78), and age (OR = 0.95; 95% CI 0.91–0.99). **Conclusions:** Cost-related nonadherence to chronic pharmaceuticals is self-reported among nearly 10% of the chronically ill patients and is strongly affected by low socioeconomic status, even under universal health insurance coverage and with relatively low co-payments as applied in Israel. Lack of information provided by physicians regarding the therapy is associated with a higher likelihood of cost-related nonadherence. **Keywords:** chronic medications, co-payment, cost, nonadherence, value-based insurance design.

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Background

Co-payments for pharmaceuticals and other health care services are usually used by health insurers as a measure of reducing health care costs. Co-payment policies may achieve two main goals: first, curbing excessive utilization of unnecessary health services, and second, shifting the burden of health care financing from public to private sources. Although patient co-payments may prevent excessive health expenditures, they may be a barrier to essential care, thus resulting in adverse health outcomes and increased health care expenditures [1–3].

Following the enactment of the National Health Insurance Law in Israel (1995), all citizens have universal health insurance coverage providing access to a broad benefits package including physician consultations, ambulatory care, hospitalization, and

medications. Citizens are free to enroll in one of four competing nonprofit health plans (health maintenance organizations) that are obligated to provide them equal access to all the services specified by the National Health Insurance Law. As of 1998, in an attempt to increase their revenues, health plans were allowed to increase co-payment charges [4]. The co-payments for chronic medications in the second largest health plan in Israel, Maccabi Healthcare Services (MHS), is 10% to 15% or 15 New Israeli shekel (NIS) per prescription (~US \$4.3). In the absence of exemptions, co-payments place a substantial financial burden on the poor, the elderly, and the chronically ill. To minimize access barriers to the care of these vulnerable populations, a quarterly ceiling for pharmaceuticals' co-payments was set for chronically ill patients, those receiving welfare payments, and holocaust survivors. Results from a recent survey in Israel conducted by the Myers-

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* Address correspondence to: Tzahit Simon-Tuval, PhD, Guilford Glazer Faculty of Business and Management, Department of Health Systems Management, Ben-Gurion University of the Negev, P.O.B. 653, Beer-Sheva 84105, Israel.

E-mail: simont@som.bgu.ac.il.

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JDC-Brookdale Institute, however, suggested that 14% of chronically ill patients reported not buying a prescribed medication because of its cost [5].

Value-based insurance design (VBID) is a measure to contain costs while improving quality of care, through linking patient's co-payments to service value in terms of benefit to patient's health, rather than to its cost. It is expected that reducing co-payments to those who will benefit most will increase patient adherence, improve health outcomes, and may reduce overall costs to the patient and the health insurer [6–8]. These designs are commonly applied by employers and health insurers in the United States on prescription drug therapy for chronically ill patients [9]. They were found to be cost-effective in post-myocardial infarction and angiotensin-converting enzyme inhibitor therapy for diabetic patients [10,11], and were associated with favorable health benefits [12] without increasing overall health care spending [9,12–15]. These favorable implications of VBIDs stem predominantly from the improvement in patients' adherence to prescribed medications [2,13,14,16–23]. Poor adherence to chronic medication therapy has been long recognized as a major driver of adverse health outcomes. Recent examples reinforced this argument, by demonstrating positive association between adherence to medication and health outcomes among chronic conditions such as cardiovascular disease, hypertension, and diabetes [24–26].

Patient-related reasons for nonadherence include among others forgetfulness, competing priorities, decision to omit doses, lack of adequate awareness of the clinical importance of the medication, and emotional factors. A considerable portion of respondents, however, does not provide reasons for their underuse [27]. Cost-related nonadherence is a well-explored phenomenon in developed countries and is prevalent in 13% to 28% of the respondents in the United States [25,28–40], 12% in Switzerland [41], 4% to 12% in different provinces in Canada [39,40], and 3% to 13% in United Kingdom, The Netherlands, Germany, Australia, and New Zealand [39]. Reduction in cost-related nonadherence was associated with improved health outcome [25,42,43]. People with more generous health insurance coverage may be less vulnerable to cost-related underuse [39,40,44]. The extent to which VBID may be an effective and feasible policy in Israel relies primarily on the proportion of chronically ill patients who do not refill their prescription solely for financial reasons. In addition, a negative association between nonadherence, adverse health outcomes, and overall health care spending needs to be confirmed.

To provide preliminary information on the expected effectiveness of VBID in our health care system, the present study aimed to examine to what extent nonadherence of chronically ill patients to medication regimens is related to financial reasons. We analyzed the determinants associated with cost-related nonadherence in the context of the Israeli health system, which provides more generously universal health insurance coverage, as compared with the United States. We hypothesized that nonadherence stems to some extent solely from financial reasons even in the Israeli health care system and that socioeconomic status is an independent determinant of cost-related nonadherence.

Methods

A telephone survey was conducted during 2012 among enrollees of MHS, the second largest health plan in Israel, providing health care for approximately 2 million members. The study was approved by the Institutional Ethics Committee. The study population was a representative sample of MHS enrollees aged 55 years or older, who are included in the Diabetes and

Cardiovascular Disease Registry of the MHS. The algorithm used to enroll patients in this registry is based, among other criteria, on evidence of prescription refill of chronic medications. This sample was chosen using computer-generated random selection.

We developed a 12-month recall questionnaire that was partially based on a validated questionnaire developed by the Myers-JDC-Brookdale Institute [5]. The questionnaire included demographic and socioeconomic characteristics such as age, sex, marital status, education, and income; self-reported out-of-pocket expenditure on prescribed medication; question on whether physician provided them explanation regarding prescribed medications; self-reported adherence; and reasons for nonadherence.

Respondents were defined as nonadherent because of financial reasons if they reported not purchasing at least one of their prescribed medications over a period of 12 months before the interview date because of their cost (i.e., patients' co-payment). Respondent who reported not purchasing prescribed medications because of different reasons, such as adverse effects, difficulties in adapting to dosage regimens, forgetfulness, interest in alternative treatment, or having a feeling that they are healed, were not defined as nonadherent because of financial reasons.

All continuous variables were non-normally distributed and presented as mean \pm SD and median (interquartile range). Dichotomous indicator values are presented as proportions. Comparison between group medians and proportions was done using Mann-Whitney *U* test and chi-square test, respectively. We used multivariable logistic regression analysis to examine predictors of nonadherence (dependent variable). Independent variables included age, sex, marital status, being a new immigrant to Israel, possession of supplemental insurance, employment status, education, income, out-of-pocket expenditure on prescribed medication, and receiving physician explanation regarding prescribed medications. Data were analyzed using STATA software (version 11.0, StataCorp, College Station, TX.) *P* values of <0.05 determined statistical significance in all analyses.

Results

Five hundred twenty-two chronically ill patients were included in our analysis (median age of 69 years (13) and 53% males). One hundred sixty-five patients (31.6%) reported not purchasing prescribed medications mainly because of their adverse effects and/or cost. Fifty patients (9.6% of the study sample) reported cost-related nonadherence. Of these, 36 (72%) stated that they did not adhere to at least one of their prescribed chronic medication solely because of its cost and 14 (28%) reported cost-related underuse in addition to other reason (mainly adverse effects). Forty-three patients (86% of the nonadherent patients) stated that they would have bought the medication if its cost was lower (one patient reported that he would not purchase even if its cost was lower, and six patients reported that they were not sure).

As depicted in Table 1, adherent patients ($n = 464$) were comparable to nonadherent patients in their demographic and socioeconomic characteristics (e.g., age, sex, education, and possession of voluntary supplementary health insurance), with only two exceptions. First, a significantly lower proportion of nonadherent respondents reported that they had worked during 3 months before the interview date (10% vs. 31.9%, respectively; $P = 0.001$). Second, a significantly higher proportion of nonadherent respondents reported having a household income lower than 4600NIS (US \$1314) per month (52.0% vs. 26.5%, respectively; $P = 0.002$). However, no significant differences between groups were found with regard to the reported monthly out-of-pocket expenditure on prescribed medications (Table 2). Finally, as presented in Table 2, a significantly lower proportion of

Table 1 – Comparison of characteristics between adherent and nonadherent chronically ill patients.

Characteristic	Nonadherent	Adherent	P
n	50	464	
Sex: male, %	48.0	53.0	0.50*
Age (y) [†]	68.7 ± 9.3, 66 (12)	70.0 ± 8.9, 69 (13)	0.18 [‡]
% live alone	28.0	25.2	0.67*
Family size [†]	2.4 ± 1.4, 2 (1)	2.7 ± 1.8, 2 (1)	0.33 [‡]
% new immigrants	12.0	12.0	0.99*
Continent of birth (%)			
Israel	42.0	31.0	0.30*
Europe	36.0	33.6	
Asia	10.0	19.4	
North Africa	4.0	9.7	
USA and Canada	8.0	6.0	
% owning supplementary insurance	90.0	92.0	0.62*
% employed in the last 3 mo	10.0	31.9	0.001*
Monthly household income (NIS), %			
<4,600	52.0	26.5	0.002*
4,600–8,000	18.0	17.2	
8,000–12,500	8.0	16.1	
≥ 12,500	2.0	12.0	
Not reported	20.0	28.2	
Education (%)			
No formal education	0.0	2.4	0.51*
Elementary and secondary	48.0	44.6	
Higher education	52.0	53.0	

NIS, New Israeli shekels.

* Chi-square test.

[†] Values are mean ± SD, median (interquartile range).[‡] Mann-Whitney U test.

nonadherent respondents reported that they received physician explanation regarding their medication therapy (69.4% vs. 82.7%, respectively; $P = 0.04$).

A multivariable analysis revealed three main determinants associated with cost-related nonadherence (Table 3). First, compared with respondents who reported a monthly household income

of 12,500NIS (~US \$3500) or higher, respondents who reported a monthly household income of lower than 4600NIS (~US \$1300) had approximately 11 times higher likelihood to be nonadherent

Table 2 – Relationship between adherence, monthly out-of-pocket expenditure, and physician explanation.

Variable	Nonadherent	Adherent	P
n	50	464	
% monthly out-of-pocket expenditure (NIS) for prescribed medication of			
≤50	8.2	13.3	0.49*
51–150	24.5	30.7	
151–250	18.4	15.6	
> 250	49.0	40.5	
% Receiving physician explanation regarding prescribed medication	69.4	82.7	0.04*

NIS, New Israeli shekels.

* Chi-square test.

Table 3 – Multivariable logistic regression model^a of the determinants of nonadherence.

Variable	OR	95% CI	P
Age (year + 1)	0.95	0.91–0.99	0.024
Monthly household income (NIS)			
≥12,500	1 (reference)		
8,000–12,500	3.24	0.36–29.01	0.293
4,600–8,000	5.45	0.68–43.67	0.110
<4,600	10.86	1.45–81.12	0.020
Worked during the last 3 mo			
Yes	1 (reference)		
No	4.32	1.47–12.66	0.008
Not receiving physician explanation regarding prescribed medication (vs. receiving one)	2.38	1.18–4.78	0.015

Note. Excluded from the model because of insignificant association: sex, living alone (vs. couples), family size, being an immigrant, continent of birth, having supplementary insurance, education, and monthly out-of-pocket expenditure for prescribed medication.

CI, confidence interval; NIS, New Israeli shekels; OR, odds ratio; ROC, receiver operating characteristic.

^a n = 504; area under ROC curve = 0.75.

because of financial reasons (odds ratio [OR] = 10.86; 95% confidence interval [CI] 1.45–81.12). Second, respondents who were unemployed during 3 months before the interview date were more likely to report cost-related nonadherence (OR = 4.32; 95% CI 1.47–12.66). And third, lack of physician explanation about prescribed medication increased the odds of reporting cost-related underuse (OR = 2.38; 95% CI 1.18–4.78) (Table 3). In the presence of these covariates, older age was associated with a lower likelihood of cost-related nonadherence (OR = 0.95; 95% CI 0.91–0.99).

Discussion

Our findings suggest that cost-related nonadherence to chronic pharmaceuticals is self-reported among nearly 10% of the chronically ill patients and is strongly affected by low socioeconomic status, even under universal health insurance coverage and with relatively low co-payments that are applied in Israel. In addition, a notable finding of our survey is that cost-related underuse is associated with lack of information provided by physicians regarding the prescribed therapy. The following discussion considers these results in light of the currently available literature.

Approximately 10% of our study sample reported cost-related nonadherence in the previous year. This proportion is lower than that found in previous studies conducted in the United States among patients with various chronic comorbidities [29–32,34–38], patients with diabetes [28,33,45,46], and patients with cardiovascular disease [25], where 13% to 28% of the respondents reported cost-related nonadherence. This difference may be attributed to two main reasons. The first is differences in health insurance coverage. Chronically ill patients in Israel have universal health insurance coverage that is provided by the National Health Insurance Law with a broad benefits package that is mostly publicly subsidized, whereas chronically ill patients in the United States hold relatively less generous and/or privately financed health insurance coverage. The relatively more progressive finance design in Israel may present lower barriers to care compared with the United States [47,48], thus resulting in lower rates of cost-related nonadherence. This argument is reinforced by the fact that similar rates of cost-related underuse were reported by respondents from countries with mandatory and mostly publicly financed health insurance coverage such as Ontario, British Columbia, and Manitoba in Canada [39], Switzerland [41], and Germany [40], yet the rate of cost-related nonadherence in our study was somewhat higher than the rate reported in the United Kingdom and The Netherlands [40]. The second reason for the relatively low rates of nonadherence may stem from the fact that our respondents were relatively old. Compared with 13% to 15% of the respondents mostly older than 65 years who reported cost-related underuse in several studies [30–32,36], more than 22% of younger cohorts reported underuse derived from financial reasons [28,29]. Similarly, adults younger than 65 years were more likely to report cost-related nonadherence than were patients older than 65 years [33,34]. This trend was found in other studies as well [39,40,44] and is reinforced in our study, in which cost-related underuse was associated with lower age in the presence of other covariates.

Nonadherence was also significantly associated with low socioeconomic status as measured by household income and employment status. In particular, a higher likelihood of underuse that stems from financial reasons was observed among the two lowest deciles of household income than among the highest deciles. Similar results were found in previous studies [29,33,36,40,41,44]. Low-income patients may be more sensitive to higher co-payments. The pioneer study of the RAND Health Insurance Experiment provided robust evidence for the fact that low-income patients are more sensitive to higher co-payments

[49]. Contemporary evidence reveals that patients in low-income areas in the United States were more sensitive to changes in co-payments than in those in high- or middle-income areas [50] and that the negative influence of co-payment on adherence is more likely to be present among middle-income and lower-middle-income patients [51]. Similar findings were found in studies conducted in Israel [52–55]. In addition, the association between low socioeconomic status and nonadherence can be attributed to the fact that patients from low socioeconomic status have a greater likelihood of exposure to health risk behaviors, such as smoking, poor diet, nonattendance to health checkups as well as poor compliance with prescribed therapy [56,57].

An additional independent determinant of cost-related nonadherence in our study was lack of information provided by physicians regarding the prescribed medication. Little is known about the role of the patient-physician relationship in cost-related nonadherence [44]. Piette et al. [58] found that patient with higher out-of-pocket costs were more likely to report cost-related nonadherence when patients' trust in their physician was low and that low income was associated with cost-related nonadherence only in the presence of low trust. In addition, it was found that only few chronically ill patients share their economic difficulties in purchasing medication with their clinician [59].

Patients' ability to comprehend health information is vital to maintaining and improving their health. It was estimated that almost one third of the US population hold inadequate health literacy [60]. Although physician practice may be affected by this considerable public health problem, numerous studies have found that physicians do not assess their patients' health literacy skills and address them efficiently [60]. Following the chronic care model, health outcomes can be improved with patient education and improved physician communication skills that take into account patients' health literacy levels [61–63]. This patient-physician partnership includes supporting patients to improve their quality of life despite their chronic condition, teaching problem-solving skills that are relevant to patients' real life, helping patients set goals, adjusting therapy to optimized disease control, and ensuring follow-up rather than solely providing technical information [61–63]. Several recent studies share an ongoing robust evidence that implementation of strategies based on this concept improves chronically ill patients' outcomes [64–68]. Further research is warranted to explore whether poor physician-patient communication that lead to cost-related nonadherence stems from linguistic or cultural barriers. Our results, however, highlight the need to incorporate measures to improve the patient-physician relationship in intervention strategies in addition to applying an optimal co-payment design.

Our analysis is subject to several limitations. First, we surveyed a representative sample of chronically ill patients, in one of the four health plans in Israel. Hence, our results may not be generalizable to the entire Israeli population because health plans vary in their patients' characteristics. Therefore, further research among the three other health plans may be warranted. Second, our analysis is based on a self-reported adherence and not on objective measure. This may lead to inaccuracies relating to patients' memories and to the tendency of patients to provide an answer that they think the interviewer views favorably [69]. This limitation, however, does not weaken our conclusions because our study was not designed to measure the extent of nonadherence but rather to explore its reasons. In addition, although purchasing a medication does not ensure its use, a recent study on the adherence and efficacy of statins suggests that a high association between medication purchase and actual uptake exists [70]. Finally, our cross-sectional design provides a snapshot to self-reported reasons of nonadherence that may be time and consequence dependent. Further research that will extract reasons for nonadherence in a longitudinal design of

disease-specific cohorts is thus needed. Notwithstanding these limitations, our study is, to our knowledge, the first to evaluate cost-related nonadherence among a representative cohort of chronically ill patients in Israel. Our results suggest that this financial source of nonadherence is not marginal even in an environment of universal health insurance coverage. Thus, designing a benefit structure that minimizes cost-related nonadherence may improve adherence among up to 10% of patients. The nature of these structures is still unclear because evidence of the impact of VBIDs in decreasing cost-related nonadherence from the United States is relatively ambiguous. Although one analysis suggested that VBID decreased self-reported cost-related nonadherence by 58% after the elimination of co-payment [28], only modest reductions were found in others [30–32].

Conclusions

We conclude that cost-related underuse of chronic pharmaceutical therapy is self-reported among approximately 10% of the chronically ill patients and is strongly affected by low socioeconomic status, as measured by lower income and unemployment, even under universal health insurance coverage and with relatively low co-payments as applied in Israel. Moreover, lack of information regarding the prescribed therapy provided by physicians is associated with a higher likelihood of cost-related nonadherence. Despite its recognized limitations, the findings from our preliminary study support the removal of financial barriers for nonadherence in Israel. Because the current study analyzed adherence to prescribed medication for chronically ill patients, it seems that the risk of overutilization is less likely even if co-payments will be reduced. In addition, the health insurance coverage in Israel is provided by nonprofit organizations that are financed mainly through health and income tax payments (not direct premiums). Thus, it is assumed that the potential benefit of VBID may outweigh its risks. Further research is required for a longitudinal analysis of the pattern of health care utilization of adherent and nonadherent chronically ill patients. Evidence of both significant rate of cost-related nonadherence and negative association between adherence and long-term health care expenditure may force health care policymakers to adopt value-based insurance designs. These may include co-payments differentiated by treatment value rather than by its cost to improve adherence and outcomes with the potential of reducing long-term health care spending.

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