

Impact of Workplace Health Services on Adherence to Chronic Medications

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Patient adherence to medications is increasingly being recognized as an essential requirement for effective medical treatment. Recent studies have demonstrated that poor adherence is associated with lower success rates for treatment to target levels and increased adverse clinical outcomes for a number of conditions, including hypertension,¹ coronary artery disease,² diabetes,³ and overall mortality.⁴ Poor adherence also is associated with increased utilization of healthcare resources and intensification of medical therapy,⁵ as providers strive to reach desired clinical outcome goals.

Many factors have been demonstrated to play a role in medication adherence. Prescription-related issues include dosing frequency and prescription duration. Patient out-of-pocket costs are now well established as an important contributor, with increasing costs associated with lower medication adherence. Other patient-related issues include age, sex, health status, and comorbidities.^{6,7} Additionally, adherence is generally greater for medications that provide symptom relief, as opposed to those used for treatment of a generally asymptomatic condition.⁸

An important factor in medication adherence appears to be patient understanding and awareness of the condition being treated.⁹ With healthcare providers often ill equipped to address low health literacy in terms of training, time, and resources, this issue represents an ongoing and significant concern.

As employers become more involved in efforts to improve healthcare quality and control medical expenditures, maximizing medication adherence rates represents an important opportunity. Value-based benefit design strategies, such as lowering copayments for medications used to treat chronic conditions, represent one successful approach used by a number of employers.¹⁰

Some employers have opted for a more comprehensive approach to healthcare management by direct contracting for workplace primary care and pharmacy services. As a result of improved access to care and elimination of the traditional fee-for-service model, patients can benefit from far more clinician contact time for more effective health education and management. This approach to healthcare delivery is likely to result in enhanced patient understanding and self-care of chronic conditions, including medication adherence. Yet despite the fact these employer-sponsored offerings have existed for decades, no studies to our knowledge have been published that demonstrate an associa-

tion between workplace health services and medication adherence. Yet despite the fact these employer-sponsored offerings have existed for decades, no studies to our knowledge have been published that demonstrate an associa-

Objective: To test the association between integrated workplace health and pharmacy care and medication adherence.

Study Design: Adherence rates for commonly used chronic disease medications were compared in a retrospective, non-case-controlled study of 4476 workplace-treated patients versus 13,134 community-treated patients.

Methods: Pharmacy claims data were used to compute the medication possession ratio for patients who received care in different settings for 20 therapeutic classes. Statistical tests for assessing between-group differences were performed, controlling for differences due to age, sex, number of chronic conditions, number of medication therapeutic classes, and patient out-of-pocket cost per therapy day. Results were reported for overall adherence as well as adherence for patients on new medications.

Results: Significant differences were found between workplace-treated patients and community-treated patients. Workplace-treated patients had overall adherence rates that were 9.72% higher than those of community-treated patients. This pattern was repeated with an overall adherence rate that was 9.52% higher for workplace-treated patients when prescriptions were limited to medication new starts.

Conclusions: Integrated workplace primary care and pharmacy services are one way to increase medication adherence. These services have the potential not only to save healthcare dollars, but also improve the lives of chronically ill patients.

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Take-Away Points

The association between integrated workplace health and pharmacy care and medication adherence was examined in a retrospective study of workplace-treated patients versus community-treated patients.

- Patients who used workplace primary care and pharmacy services had higher adherence rates to medications for their chronic conditions.
- There was a significant trend regardless of the medication type, number of days supply, or geographic location toward workplace-treated patients being more adherent to drug treatment.
- By investing in integrated workplace primary care and pharmacy services, employers may realize improved medication adherence rates, resulting in potential healthcare cost savings.

workplace pharmacy were selected as the main focus of this study (from this point on called the workplace-treated group). The individuals at these locations who used community health services only were excluded to reduce selection bias, as those who had access to workplace health services but chose not to use them may differ from those who used work-

place health services. The comparison group (from this point on called the community-treated group) was selected from the remaining 4 locations without workplace health centers, as long as they met the minimum office visit and prescription requirements.

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Next, for both groups, pharmacy claims data were used to associate the National Drug Code for each prescription filled with the appropriate American Hospital Formulary Service number to identify the therapeutic class for that drug.¹³ The top 20 therapeutic classes of drugs used primarily to treat chronic conditions for this population were then identified based on the number of prescriptions filled and the number of unique patients with prescriptions in each class. Therapeutic drug classes used to treat diabetes mellitus, hypertension, heart arrhythmia, heart disease, and thyroid disease were included. Finally, only patients with at least 1 prescription in 2006 for 1 or more drugs within these 20 therapeutic classes were retained for analysis.

METHODS

The objective of this study was to test the hypothesis that patients who use an integrated workplace primary care and pharmacy service have higher rates of adherence to commonly used medications for chronic conditions than patients who use community-based services. This retrospective, non-case-controlled study compared the medication adherence of these 2 groups during 2006.

The health benefit-covered population from 8 different locations of a large, self-insured employer's active and retiree population along with their eligible dependents was selected for potential inclusion in this study. Demographic, medical claims, and pharmacy claims data were obtained for this population covering all dates of service during the time period of January 1, 2005, through December 31, 2006. All locations had stable populations covered by the same health benefit plan, and the 4 workplace health center locations have been continuously operated by the same workplace health vendor for more than 15 years. Calendar year 2005 was used as the baseline year from which the populations were selected into their respective groups, and calendar year 2006 was the study year from which medication adherence was determined using the methods described below.

First, from the baseline year (2005) all covered lives with a claim for at least 1 medical office visit and 1 or more prescriptions were selected. The requirement of an office visit provided the opportunity for a physician to discuss compliance with drug therapy with the patient. At the 4 locations where the population had access to workplace primary care and pharmacy (called workplace health centers from this point forward), only those patients who had at least 1 office visit at the workplace health center and at least 1 prescription filled at the

The final study population consisted of 17,610 unique patients who were on average 60 years of age. More than half of the study population was male, and 61.95% were retirees or retiree dependents. To assess the level of chronic disease burden in this population, we reviewed the diagnosis codes for each patient from the medical claims data and determined the prevalence of relevant conditions for the therapeutic classes included in the study. The average number of unique therapeutic classes for which each person had prescriptions filled also were determined using all possible therapeutic classes (not limited to the top 20), with a mean of 5.8 classes. Patient out-of-pocket costs for prescription drugs varied by drug tier, days supply, and where the prescription was filled. Because decreased adherence has been linked to increases in copayments¹⁴ and the average copayment amount differed by group, we computed cost per therapy day and controlled for this in the analysis. As shown in **Table 1**, the average patient cost per therapy day was \$0.45.

Workplace-treated patients (n = 4476) were 4 years older than community-treated patients (n = 13,134), and more likely to be male and retired. The workplace-treated group also

■ **Table 1.** Study Population Characteristics

Characteristic	Study Population (n = 17,610)	Workplace Treated (n = 4,476)	Community Treated (n = 13,134)
Mean age (SD), y	60.39 (12.73)	63.56 (12.91)	59.31 (12.48)
Male, %	55.72	58.39	54.83
Active employees and dependents, %	38.05	31.61	40.24
Retired employees and dependents, %	61.95	68.39	59.76
Eligible for entire study period, %	98.74	98.76	98.74
Mean number of chronic conditions (out of 7) ^a	1.86	1.97	1.82
Mean number of therapeutic classes	5.81	6.09	5.71
Mean patient copayment cost per therapy day, \$	0.45	0.29	0.50

^aThe chronic conditions were diabetes, chronic obstructive pulmonary disease, congestive heart failure, coronary artery disease, hypertension, thyroid disease, and heart arrhythmia.

had, on average, a higher chronic disease burden and were prescribed a slightly higher number of therapeutic classes than the community-treated group. Patient cost per therapy day was lower for the workplace-treated group (\$0.29 vs \$0.50). Because the differences in age, sex, number of chronic conditions, number of therapeutic classes, and the patient out-of-pocket cost per therapy day were statistically significant at the $P < .05$ level, we controlled for them in the analysis.

Our measure of adherence was based on the medication possession ratio (MPR). This is defined as the proportion of days covered by a given drug class over the course of the year, based on the number of days supplied and the quantity of medication dispensed for each filled prescription.¹⁵ We therefore defined actual adherent days as the number of days in 2006 that the patient had the medicine available from the date of service of the first prescription for each therapeutic class either through December 31, 2006, or to the termination of patient eligibility for benefits, whichever came first. Potential adherent days were defined as the number of days in 2006 from the date of service of the first prescription for each therapeutic class either through December 31, 2006, or to the termination of patient eligibility for benefits, whichever came first. Thus, the MPR was calculated as:

$$\text{MPR} = \text{Actual Adherent Days} \div \text{Potential Adherent Days}$$

A day was assumed to be covered if any drug in that class was available. Because of this, estimates of adherence represent an upper bound on actual adherence with prescribed therapy. Although this measure may not be as accurate as pill counts or similar methods involving direct measurement, MPR both is routinely used as a measure of adherence in the medical literature^{7,10,16} and is a recommended measure of medication adherence for population-based outcomes evaluations

by the DMAA: The Care Continuum Alliance in volume 3 of the *Outcomes Guidelines Report* published in 2009 and by the International Society of Pharmacoeconomics and Outcomes Research.¹⁷

It is worth noting that MPR is a medication-specific measurement, rather than a patient-specific measurement. Thus, patients taking different medications may have a different MPR for each of their medications. In this study we intentionally focused on adherence for patients at various points during their drug treatment. The literature on issues surrounding compliance with “new starts” of medication is well established,⁷ so although new starts are addressed in the Results section, they are not the main focus of the study.

The χ^2 and t tests were used for simple comparisons of differences between the groups for categorical and continuous variables, respectively. Linear regression was used to assess differences in medication adherence rates between the groups while controlling for age, sex, chronic conditions, number of therapeutic medication classes, and patient out-of-pocket cost per therapy day. For all statistical tests, a 2-tailed P value of $< .01$ was considered statistically significant. All statistical analyses were performed with SAS statistical software, version 9.1.3 (SAS Institute Inc, Cary, NC).

RESULTS

The workplace-treated group had higher adherence rates across all therapeutic classes than the community-treated group (Table 2). Two therapeutic classes for drugs used to treat heart arrhythmia, class 1B and 1C antiarrhythmics, did not meet the test for statistical significance at the $P < .01$ level. All other therapeutic classes showed statistically significant differences, with the largest difference found for class III antiarrhythmics, a 19.91% higher adherence rate for

the workplace-treated group. When therapeutic classes were combined into disease groups, medications used to treat diabetes showed the largest increase in adherence (12.65%) for the workplace-treated group. Smaller, but similar increases in adherence were seen for hypertension, heart arrhythmia, and heart disease. Across the 20 therapeutic classes, the MPR for the workplace-treated group was 9.72% higher than that for the community-treated group.

Although there is no agreed-upon standard for what constitutes adequate medication adherence, 80% or higher is typically deemed acceptable for most chronic conditions.^{7,17} This 80% threshold was met or exceeded for the majority of individual therapeutic classes for the workplace-treated group. The community-treated group, on the other hand, achieved

an 80% rate only for a single therapeutic class, thyroid agents. The **Figure** shows adherence quintiles for patients in each group who took diabetes medications. Compared with the community-treated group, patients in the workplace-treated group were 26.7% more likely to have an 80% or higher adherence rate ($P < .0001$). Nearly 70% of the workplace-treated patients with diabetes met this measure of optimal adherence compared with only 55% of the community-treated group. Although not specifically studied, increased adherence is presumed to be associated with better clinical outcomes.

The literature points out that medication adherence rates tend to drop dramatically after the first 6 months of therapy when patients begin taking a new medication.⁷ This lack of persistence is due to a number of factors including side ef-

■ **Table 2.** Medication Adherence Rate: Workplace-Treated vs Community-Treated Patients

Therapeutic Class	Adherent Patients, %		Net Difference, %	Percent Difference	P	Adjusted P Value ^a
	Workplace Treated (n = 4476)	Community Treated (n = 13,134)				
α-Adrenergic blocking agent	82.67	75.72	6.95	9.18	.0002	<.0001
Angiotensin II receptor antagonist	81.66	74.29	7.37	9.92	<.0001	<.0001
Angiotensin-converting enzyme inhibitor	81.49	75.60	5.89	7.79	<.0001	<.0001
Antiarrhythmics, miscellaneous	77.55	73.92	3.63	4.91	.1441	.0031
β-Adrenergic blocking agent	79.56	74.95	4.61	6.15	<.0001	<.0001
Biguanides	79.91	69.49	10.42	14.99	<.0001	<.0001
Calcium-channel blocking agent, miscellaneous	82.32	77.19	5.13	6.65	.0006	<.0001
Class IB antiarrhythmics	80.97	72.49	8.48	11.70	.0915	.0206
Class IC antiarrhythmics	72.61	71.90	0.71	0.99	.9188	.3137
Class III antiarrhythmics	77.22	64.40	12.82	19.91	.0041	.0091
Dihydropyridines	80.58	71.80	8.78	12.23	<.0001	<.0001
Fibric acid derivatives	80.76	70.56	10.20	14.46	<.0001	<.0001
HMG-CoA reductase inhibitors	79.70	71.58	8.12	11.34	.1767	<.0001
Insulins	68.85	62.68	6.17	9.84	.0063	.0002
Platelet-aggregation inhibitors	81.39	74.69	6.70	8.97	<.0001	<.0001
Sulfonylureas	80.65	73.98	6.67	9.02	<.0001	<.0001
Thiazide diuretics	77.03	69.44	7.59	10.93	<.0001	<.0001
Thiazide-like diuretics	77.23	70.57	6.66	9.44	.0139	<.0001
Thiazolidinediones	81.61	73.22	8.39	11.46	<.0001	<.0001
Thyroid agents	85.14	80.03	5.11	6.39	<.0001	<.0001
Diabetes therapeutic classes combined	82.81	73.51	9.30	12.65	<.0001	<.0001
Hypertension therapeutic classes combined	80.65	73.24	7.41	10.12	<.0001	<.0001
Heart arrhythmia therapeutic classes combined	77.85	72.65	5.20	7.16	.0086	.0078
Heart disease therapeutic classes combined	84.10	78.52	5.58	7.11	<.0001	<.0001
All 20 therapeutic classes	80.38	73.26	7.12	9.72	<.0001	<.0001

HMG-CoA indicates hydroxymethyl glutaryl coenzyme A.

^aControlling for age, sex, number of chronic conditions, number of therapeutic classes, and patient out-of-pocket cost per therapy day.

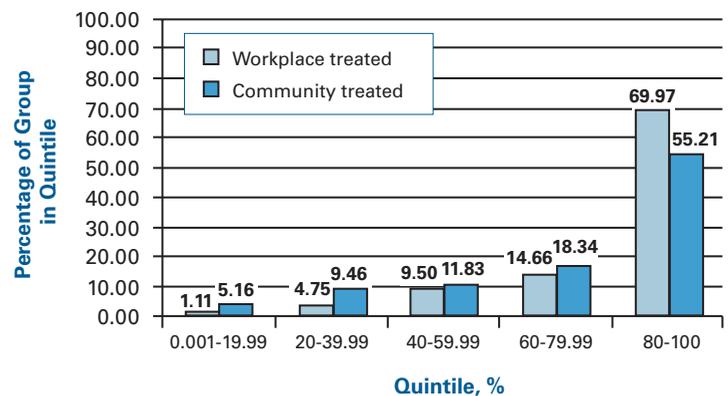
fects, lack of belief in the need for, or efficacy of, a given medication, cost, and inconvenience.¹⁸ We looked at the impact of workplace health services on patient adherence to new medications. New medication starts were defined as at least 1 pharmacy claim for a therapeutic class during the study year (2006) when the patient did not have a claim for the same therapeutic class during the baseline year (2005). The results of this analysis are shown in **Table 3**. Consistent with the literature, adherence in all 20 therapeutic classes was lower for patients with new medication starts than it was for patients at various points in their drug treatment continuum. However, like Table 2, Table 3 shows that workplace-treated patients had a higher MPR than community-treated patients for nearly all individual therapeutic classes as well as the combined classes.

DISCUSSION

Medication adherence is now recognized as an important contributor to effective chronic condition management. A number of strategies have been proposed to improve patient adherence with medications, including informational interventions, behavioral-based interventions, family and social interventions, or a combination of these approaches. Most have achieved limited success,¹⁹ with few significantly affecting clinical outcomes.²⁰ Currently, an increasing level of attention is being directed toward overcoming identified financial barriers to medication acquisition. The economic justification for this approach—so-called value-based benefit design—is based on evidence that improved medication adherence results in significantly lower overall healthcare costs. Although recent studies demonstrate support for this model, adherence rates remain less than optimal,¹⁰ indicating that there is a need for a more comprehensive approach to increasing medication adherence.

A major limitation of each of these approaches is that the incentive to increase medication adherence is external. Although there may be a valid economic basis on which to justify 1 or more of these interventions, perhaps the most effective strategy is to ensure that patients sufficiently understand their diagnosis, the rationale for drug therapy, and the consequences of not taking their medications. When this information is sufficiently understood and internalized, external incentives may become secondary, particularly for those with reasonable wages and benefits. Internalizing the need to follow the treatment plan set out by a patient’s physician and reinforced by the patient’s pharmacist or other “trusted

■ **Figure.** Diabetes Medication Adherence Quintiles: Workplace-Treated vs Community-Treated Patients



clinician” is a major step toward accepting responsibility for self-care.

The results from this study indicate that users of a workplace health service had statistically significant increases in medication adherence across many therapeutic classes compared with nonusers of workplace health services. Notably, when adherence was analyzed by quintiles, the data show that compared with the community-treated group, the workplace-treated group had a fairly consistent upward shift and comparative reductions in the percentage of patients in each of the low-quintile categories.

This broad-based upward shift in adherence for the workplace-treated group leads us to speculate that the observed increase in medication adherence might originate from the quality of the patient-provider relationship. In this trusted clinician role, providers can not only educate their patients about the importance of taking prescribed medications but also provide a true medical home that provides the follow-up and continuity of care that enhance the bond between clinician and patient with each encounter, creating the trust needed by patients to make the daily decision to actively participate in their treatment.^{21,22} It is important to note that no formal provider or patient education program regarding medication adherence was implemented during this study period; it is possible that a more focused program could have generated even more favorable adherence outcomes.

Anecdotally, increased adherence may be due to having a pharmacy at the workplace. Having both primary care and pharmacy services at the workplace is extremely convenient. Patients who have a medical visit can fill their prescription without leaving the health center, avoiding a trip to a community pharmacy or having to complete mail order forms to fill their prescriptions. There also is a social aspect of workplace primary care and pharmacy that might come into play for retirees in particular, as the workplace pharmacy provides

■ **Table 3.** Medication Adherence Rate: New Starts Only

Therapeutic Class	Adherent Patients, %		Net Difference, %	Percent Difference	P	Adjusted P Value ^a
	Workplace Treated (n = 2425)	Community Treated (n = 7436)				
α-Adrenergic blocking agent	73.45	69.90	3.55	5.08	.3838	.0026
Angiotensin II receptor antagonist	76.26	70.19	6.07	8.65	.0015	<.0001
Angiotensin-converting enzyme inhibitor	73.72	68.47	5.25	7.52	<.0001	<.0001
Antiarrhythmics, miscellaneous	67.19	68.36	-1.17	-1.71	.8190	.3107
β-Adrenergic blocking agent	69.97	67.83	2.14	3.15	.1763	<.0001
Biguanides	74.16	64.64	9.52	14.73	<.0001	<.0001
Calcium-channel blocking agent, miscellaneous	69.90	68.31	1.59	2.33	.6236	.0213
Class IB antiarrhythmics	71.34	62.89	8.45	13.44	.4322	.1476
Class IC antiarrhythmics	57.54	52.68	4.86	9.23	.7144	.3430
Class III antiarrhythmics	76.84	59.38	17.46	29.40	.0196	.0249
Dihydropyridines	74.20	66.20	8.00	12.08	.0003	<.0001
Fibric acid derivatives	75.60	66.59	9.01	13.53	.0007	<.0001
HMG-CoA reductase inhibitors	74.02	66.00	8.02	12.15	<.0001	<.0001
Insulins	63.66	56.89	6.77	11.90	.1111	.4651
Platelet-aggregation inhibitors	80.13	71.38	8.75	12.26	.0008	<.0001
Sulfonylureas	74.15	68.10	6.05	8.88	.0171	<.0001
Thiazide diuretics	68.57	60.57	8.00	13.21	<.0001	<.0001
Thiazide-like diuretics	67.75	63.21	4.54	7.18	.3467	.0089
Thiazolidinediones	78.56	70.22	8.34	11.88	.0033	<.0001
Thyroid agents	78.68	74.21	4.47	6.02	.0598	<.0001
Diabetes therapeutic classes combined	75.70	66.39	9.31	14.02	<.0001	<.0001
Hypertension therapeutic classes combined	73.20	66.47	6.73	10.12	<.0001	<.0001
Heart arrhythmia therapeutic classes combined	69.81	64.80	5.01	7.73	.2033	.4393
Heart disease therapeutic classes combined	73.71	68.11	5.60	8.22	<.0001	<.0001
All 20 therapeutic classes	73.31	66.94	6.37	9.52	<.0001	<.0001

HMG-CoA indicates hydroxymethyl glutaryl coenzyme A.

^aControlling for age, sex, number of chronic conditions, number of therapeutic classes, and patient out-of-pocket cost per therapy day.

an outlet for seeing people with whom they used to work. Patients also develop relationships with their trusted pharmacists, which might lead to a preference for face-to-face interactions over mail order. It also is possible that the amount of time spent on learning about disease states at the workplace health centers brings a heightened focus for the patient, the clinician, and the pharmacist on the importance of adherence to medication regimens.

This study has a number of limitations. First, the workplace-treated patients may represent a self-selected population that is, for some reason, more motivated to be adherent with their medication regimen than patients treated in the community. However, the demographics show that the 2 groups are at least somewhat similar and the differences observed were controlled

for in the analysis, supporting the idea that the observed effect is due to the nature of the patient interaction within the workplace primary care and pharmacy. Additionally, the study fails to incorporate physician discontinuation of medication. Although the study design accounts for and includes switches of medication either within the same therapeutic class or (in the case of the grouped classes) by disease, claims data did not allow us to ascertain cases where a physician simply eliminated a prescription for a given drug class. Attempting to determine these cases would have required medical chart review, which was beyond the scope of this study. However, the impact of any possible medication stops by a clinician is unlikely to differ substantially between the workplace-treated and community-treated groups, so we feel the impact was minimal.

Next, adherence rates were calculated using claims data, which do not capture the actual rate at which patients took their medication, nor do these data capture prescriptions for which insurance was not used. However, as mentioned earlier, measurements of adherence using claims data are fairly standard in the literature.

These results support the concept of workplace healthcare delivery. In this setting, enhanced access to medical care facilitates patient education, with the goal of promoting responsibility for self-care. Nonadherence to medications results in an additional \$100 billion in annual healthcare costs.⁸ As the number of Americans with chronic conditions rises, educating patients to take their medications regularly becomes more important. Although this is not a “one-size-fits-all” approach, workplace health services have the potential to save not only healthcare dollars, but lives as well.

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Author Disclosure: Drs Glave Frazee, Fabius, Broome, Manfred, and Davis are employees of Take Care Health Systems, the funder of this study. Take Care Health Systems provides workplace pharmacy and primary care services as described in this article. Dr Fabius reports speaking at meetings and conferences on behalf of his employer. Dr Fabius also reports serving on the executive board and owning stock in CHD Meridian Healthcare, an integrated workplace healthcare provider later purchased by Walgreens. Dr Sherman reports no relationship or financial interest with any entity that would pose a conflict of interest with the subject matter of this article.

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