Impact of an Online Prescription Management Account on Medication Adherence

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Objectives: To assess medication adherence rates of patients utilizing an online prescription management account compared with nonusers.

Study Design: A retrospective analysis was conducted using de-identified pharmacy claims data from a pharmacy benefit manager covering the period from April 1, 2009, to March 31, 2011. Patients who were continuously eligible throughout the study period and that had at least 1 prescription fill for any of the 8 therapeutic groups examined in the study were selected for inclusion.

Methods: Adherence was assessed by measuring the proportion of days covered (PDC). Propensity score matching was utilized to minimize differences in age, gender, chronic condition score, copay, household income, and urban locality between the users and nonusers groups. Results were reported for all therapeutic groups combined, as well as by individual therapeutic group.

Results: Overall, patients utilizing the online account had a significantly higher weighted average PDC (73.19% vs 61.64%, P <.0001). Users also had a higher average PDC for each individual therapeutic group, although the beta-blocker group was not statistically significant. The percentage of patients achieving an average PDC of ≥80% was also found to be greater in the users group across each therapeutic group and overall.

Conclusions: Patients who utilized an online prescription management account had higher rates of medication adherence as compared with nonusers. Additional studies are needed to assess which specific components of the prescription management account have the biggest impact on adherence.

(Am J Manag Care. 2012;18(3):e86-e90)

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Medication is generally a key component in managing patients' chronic health conditions. However, in order for the treatment to be effective, patients need to properly follow the prescribing orders and obtain refills in a timely matter. Patients who do not adhere to their chronic medication therapies as indicated run the risk of detrimentally impacting their overall health and disease progression. Several studies associate medication nonadherence with increased hospitalizations and even mortality.[1-4] Specifically, for diabetic patients, adherence rates of less than 80% have been linked to increased blood pressure, glycated hemoglobin (A1C) levels, and low-density lipoprotein levels.[1] Nonadherent diabetics are also more likely to be stricken with amputations, neuropathy, and myocardial infarctions.[5]

Nonadherence can also have an impact on medical costs for patients and payers. Patients with adherence rates of greater than 80% have been shown to have lower medical costs for diabetes, hypertension, and hyperlipidemia compared with nonadherent patients.[6,7] For diabetes and hypertension in particular, the savings are estimated at more than $3500 per person per year.[6]

Despite the complications and financial burden associated with inadequate medication adherence, an estimated 50% of patients do not follow their regimen as prescribed.[8] Given the negative outcomes and the magnitude of nonadherence, innovative approaches for managing medication therapies are constantly being sought. Researchers have been utilizing technology, such as text messaging, to improve patient adherence to medication.[9] Providing patients with convenient options for prescription fulfillment and management may help improve adherence.

As the Internet has shaped American society, with nearly 70% of households reporting having Internet access at home in 2009,[10] Internet-based applications and programs may be a way to guide patients toward refilling their medications at proper intervals. Americans are increasingly comfortable with online shopping and the prescription management account allows them to access their prescription history and refill prescriptions at the touch of a button. To our knowledge, no one has assessed medication adherence rates of patients utilizing online prescription management accounts. We hypothesize that patients who use Internet-based services to fill their prescriptions will have greater rates of adherence.

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Published as a Web exclusive
www.ajmc.com

METHODS

Patient Population

We performed a retrospective study utilizing de-identified pharmacy claims and eligibility data from a pharmacy benefit manager (PBM), covering the period from April 1, 2009, to March 31, 2011.

This analysis was limited to patients who were continuously eligible during the study period and had at least 1 prescription fill for any of the top 8 chronic therapeutic groups during the identification period of April 1, 2009, through March 31, 2010. Patients were then followed for 12 months from the date of their initial (index) prescription. Therapeutic groups were determined by the first 2 digits of the generic product identifier (GPI) based on Medi-Span. The top 8 therapeutic groups were as follows: antidepressants (58), antidiabetics (27), antihyperlipidemics (39), antihypertensives (36), beta blockers (33), diuretics (37), thyroid agents (28), and ulcer drugs (49). All maintenance drugs (as described by First DataBank) within each therapeutic group were included, regardless of dosage form. In the event a patient filled a prescription for more than 1 therapeutic group during the identification period, he or she was included in each of the respective therapeutic groups. For example, a patient filling an antidepressant and a beta blocker would be represented in both of these groups.

Patients meeting the inclusion criteria who were registered for and utilizing an online prescription management account with the PBM and who were matched were placed in the "users" group. Utilization consisted of a patient accessing the online account for at least 1 of the following for at least 6 months of the follow-up period: to check prescription coverage, locate a pharmacy, submit a refill request, or request automatic refills. Patients who were not registered for an online account with the PBM, but were matched, were placed into the "nonusers" group. All members of the PBM are given the option of enrolling in the online prescription management account. The online account provides patients with access to their prescription fill history and the opportunity to obtain automatic refills, process refills electronically, and view prescription coverage. The account also gives patients the opportunity to create a customized support page which provides information on health conditions chosen by the patient.

Propensity scoring was used to obtain 1:1 matches, using a "greedy" 5→1 matching algorithm.[11,12] This algorithm first matched users to non-users on 5 digits of the propensity score. This was repeated for those who did not match using 4 digits of the propensity score, continued down to a 1-digit match. Matches were found for all patients. Propensity scores were obtained by fitting covariates, which included age, gender, chronic condition score, copay rank, household income level quartile, and urban locality into a logistic regression model. Chronic condition score was obtained by converting chronic condition counts to a rank (0-5) scale (0 = no chronic conditions; 1 = 1 chronic condition; 2 = 2-5 chronic conditions; 3 = 6-10 chronic conditions; 4 = 11-15 chronic conditions; and 5 = ≥16 chronic conditions). Chronic condition counts were the number of unique drug-inferred conditions identified during the identification period (April 1, 2009, through March 31, 2010). These drug-inferred chronic conditions were established by mapping prescriptions to the Medi-Span Drug Indications Database.

This database provides information on common medical conditions treated by prescribed medications and is updated monthly to reflect the most current drug-disease mapping relations. Copay rank was calculated by converting copay per therapy day into a categorical variable and then quantified as low (0), medium (1), high (2), or very high (3). Copay per therapy day was calculated at the patient level and was based on all drugs within the 8 therapeutic groups included in the study. Therefore, if a patient filled prescriptions for drugs within 2 or more therapeutic groups, he or she had 1 overall copay per therapy day computed. Household income level was determined by linking patient zip code to the Internal Revenue Service Statistics of Income Tax Stats Tax Year 2008 Zip Code Data (http://www.irs.gov/taxstats/indtaxstats/article/0,,id=242739,00.html). Household income level was then scaled into quartiles (0 = low income, 1 = medium, 2 = high, and 3 = very high income). Urban locality was determined by linking Rural-Urban Commuting Area Codes from the WWAMI Rural Health Research Center (http://depts.washington.edu/uwruca/) to the patient's zip code.

Outcomes Measures

Medication adherence was measured using proportion of days covered (PDC). PDC was calculated as the sum of the days covered divided by 365 (the number of follow-up days), where days covered is based on the fill date and days supply, as indicated in the prescription claim. In the event a patient had a prescription fill for more than 1 drug within the same-

Take-Away Points

We performed a retrospective analysis to evaluate the impact of an online prescription management account on patient adherence to medication for select therapeutic groups.

- Patients who utilized the account had higher rates of medication adherence.
- Online accounts which allow patients to manage their prescription refills and enroll in services such as automatic refills may help increase medication adherence.
- Payers and pharmacies should promote the use of online accounts for prescription management.

Table 1. Propensity-Matched Population Characteristics

	Users (n = 3560)	Nonusers (n = 3560)	*P*
Average age (SD)	50.44 (12.81)	49.96 (13.09)	.1231
Male, %	41.52	42.50	.4008
Average chronic score (SD)	1.73 (0.60)	1.71 (0.59)	.1152
Average copay rank (SD)	1.55 (1.06)	1.57 (1.05)	.6464
Urban, %	88.34	89.19	.2603
Average household income quartile (SD)	1.65 (1.11)	1.67 (1.11)	.3879

SD indicates standard deviation.

therapeutic group, causing overlapping fills, overlapping days are included once.

Statistical Analyses

Chi-square test was used to assess for differences between groups for categorical variables and Student's *t* test was used to assess for differences between groups for continuous variables. A *P* value of <.05 was considered statistically significant. All statistical analyses were performed using SAS statistical software, version 9.2 (SAS Institute Inc, Cary, North Carolina). Results presented are for propensity score–matched groups.

RESULTS

As shown in Table 1, the users and nonusers groups each consisted of 3560 unique patients. Population characteristics were found to be similar between the 2 groups.

Patients utilizing the online account had a significantly higher weighted average PDC compared with that of the nonusers (73.19% vs 61.64%, *P* <.0001). Users also had a higher average PDC for each individual therapeutic group, although the beta-blocker group was not statistically significant. Results can be seen in Table 2. Table 3 shows results for the percentage of patients within each PDC range (<50%, 50%-79%, or ≥80%). Overall, the percentage of patients achieving an average PDC of ≥80% was nearly 13 percentage points higher in the users group. The users group also had a higher percentage of patients achieving a PDC of 80% or higher across each of the individual therapeutic groups. A smaller percentage of users had an average PDC of <50% compared with the nonusers (25.30% vs 37.09%).

DISCUSSION

Our results indicate that patients who have utilized an online account have significantly greater medication adherence across 7 out of 8 therapeutic groups studied, as well as overall, compared with nonusers. Additionally, the study showed that the users group had a higher proportion of patients achieving the 80% adherence mark, which can be crucial for chronic illness management.[7] Having an online prescription management account offers patients several advantages, such as the ability to order refills online and receive notification when a prescription needs to be refilled. All of the services and benefits offered through an online account may help to increase a patient's adherence to his or her medication.

Table 2. PDC: Users Versus Nonusers

	PDC, %			
Therapeutic Group	Users	Nonusers	Difference, %	*P*
Antidepressants	70.83	61.80	14.61	<.0001
Antidiabetics	75.77	70.00	8.24	.0002
Antihyperlipidemics	76.34	68.75	11.04	<.0001
Antihypertensives	78.68	69.18	13.73	<.0001
Beta blockers	72.75	70.11	3.77	.0797
Diuretics	64.85	59.75	8.54	.0046
Thyroid agents	81.04	75.13	7.87	<.0001
Ulcer drugs	62.58	46.92	33.38	<.0001
All therapeutic groups combined[a]	73.19	61.64	18.74	<.0001

PDC indicates proportion of days covered.
[a]Weighted average.

Table 3. Percentage of Patients by PDC Range in Propensity Matched-Pair Analysis

	Users				Nonusers			
Therapeutic Group	**Total n**	**<50%**	**50%-79%**	**≥80%**	**Total n**	**<50%**	**50%-79%**	**≥80%**
Antidepressants	1427	25.30	23.48	51.23	1464	37.09	22.40	40.51
Antidiabetics	625	19.68	22.56	57.76	653	27.11	22.51	50.38
Antihyperlipidemics	1507	18.31	21.90	59.79	1443	29.31	21.00	49.69
Antihypertensives	1370	16.28	19.27	64.45	1427	27.82	23.27	48.91
Beta blockers	702	24.36	21.23	54.42	722	27.56	20.22	52.22
Diuretics	575	34.26	22.09	43.65	673	41.01	20.65	38.34
Thyroid agents	612	13.24	18.79	67.97	625	19.84	20.80	59.36
Ulcer drugs	976	36.58	19.36	44.06	907	56.01	17.53	26.46
Overall[a]	3560	20.98	29.80	49.21	3560	34.41	29.21	36.38

PDC indicates proportion of days covered.
[a]Based on average patient PDC.

The online PBM account studied in this paper allowed patients to easily manage and refill their prescriptions, as well as view prescription history. This opportunity to easily refill a prescription allows patients to minimize travel and wait time. It also eliminates the need for knowing the prescription number, as is generally required when filling through automated telephonic systems. Upon signing in, the online account displays an alert on the main Web page if a patient has any prescriptions ready to be refilled. The ease of accessing prescription records and obtaining refills, and the convenience of being notified that a prescription is in need of being refilled, may help account users obtain their refills in a timely manner, thereby ensuring they are in possession of an adequate supply of medication, thus helping to avoid potential gaps in therapy.

The pharmacy benefit account also gives patients the option to have their prescriptions automatically refilled. Automatically dispensing prescriptions allows patients to obtain their refills without the risk of having gaps in therapy and without having to remember to do so. This type of service can combat one of the biggest barriers to adherence—forgetfulness.[13]

The ease and convenience of using Internet-based services, as well as providing patients with multiple options for refilling their prescriptions, may help patients stay current on their prescribed drug regimens. Given the apparent effect on adherence, more payers and pharmacies should continue to promote the use of online prescription management accounts.

As society becomes more and more technologically advanced, new opportunities for Internet-based applications aimed at improving medication adherence are likely to be introduced. Mobile/smart phone applications are one example. These applications can likely improve medication adherence through the ease and convenience of ordering refills. Future studies should assess the impact of such programs, as well as examine the specific component(s) of these programs that impact adherence the most.

It is important to note that while our study employed propensity score matching to adjust for differences in basic characteristics between groups, not all confounding factors (such as race and education level) were controlled for. Of particular importance is the likelihood of self-selection bias. Patients who choose to enroll in and use an online pharmacy benefit account may behave differently or may have different health beliefs than those who opt to not register. Therefore, our results should be interpreted with caution. Future studies might employ a pre-post design to help control for such confounding and bias. Furthermore, one of the factors used in the propensity matching was chronic score based on chronic condition count. Using prescription claims to identify chronic conditions may not capture the full extent of comorbidity or illness severity. We are not able to determine what portion of a prescription, if any, a patient actually ingested. We are also unable to determine whether a physician discontinued a medication or whether a patient paid cash or received a sample allotment, all of which could lead to underestimation of the actual adherence rate. Additionally, we were unable to determine which particular services users were utilizing and how often. Finally, patients may be utilizing other online prescription management accounts or they may receive text messages or e-mail reminders from a pharmacy when a prescription needs to be refilled.

In conclusion, patients who utilized an online prescription management account had higher rates of medication adherence as compared with nonusers. Additional studies are needed to assess which specific components of the prescription management account have the biggest impact on adherence.

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Funding Source: Self-funded by Walgreen Co.

Author Disclosures: All authors report employment with Walgreen Co, the funder of this study. At the time of this study Walgreen Co owned a PBM which offered patients online prescription management accounts.

Authorship Information: Concept and design (JGH, NK, CLP); acquisition of data (JGH, AWT); analysis and interpretation of data (JGH, PM, AWT, NK, ID); drafting of the manuscript (PM, NK, ID, CLP); critical revision of the manuscript for important intellectual content (JGH, PM, AWT, NK, ID); statistical analysis (JGH, AWT); obtaining funding (ID); administrative, technical, or logistic support (PM); and supervision (ID, CLP).

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