Annals of Internal Medicine | Original Research

The Epidemiology of Prescriptions Abandoned at the Pharmacy

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Background: Picking up prescriptions is an essential but previously unstudied component of adherence for patients who use retail pharmacies. Understanding the epidemiology and correlates of prescription abandonment may have an important effect on health care quality.

Objective: To evaluate the rates and correlates of prescription abandonment.

Design: Cross-sectional cohort study.

Setting: One large retail pharmacy chain and one large pharmacy benefits manager (PBM) in the United States.

Measurements: Prescriptions bottled at the retail pharmacy chain between 1 July 2008 and 30 September 2008 by patients insured by the PBM were identified. Pharmacy data were used to identify medications that were bottled and either dispensed or returned to stock (RTS) or abandoned. Data from the PBM were used to identify previous or subsequent dispensing at any pharmacy. The first (index) prescription in a class for each patient was assigned to 1 of 3 mutually exclusive outcomes: filled, RTS, or RTS with fill (in the 30 days after abandonment, the patient purchased a prescription for a medication in the same medication class at any pharmacy). Outcome rates were assessed by drug class, and generalized estimating equations were used to assess patient, neighborhood, insurance, and prescription characteristics associated with abandonment.

Results: 10 349 139 index prescriptions were filled by 5 249 380 patients. Overall, 3.27% of index prescriptions were abandoned; 1.77% were RTS and 1.50% were RTS with fill. Patients were least likely to abandon opiate prescriptions. Prescriptions with copayments of \$40 to \$50 and prescriptions costing more than \$50 were 3.40 times and 4.68 times more likely, respectively, to be abandoned than prescriptions with no copayment ($P < 0.001$ for both comparisons). New users of medications had a 2.74 times greater probability of abandonment than prevalent users ($P < 0.001$), and prescriptions delivered electronically were 1.64 times more likely to be abandoned than those that were not electronic ($P < 0.001$).

Limitation: The study included mainly insured patients and analyzed data collected during the summer months only.

Conclusion: Although prescription abandonment represents a small component of medication nonadherence, the correlates to abandonment highlight important opportunities to intervene and thereby improve medication taking.

Primary Funding Source: CVS Caremark.

Ann Intern Med. 2010;153:633-640. www.annals.org
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Nonadherence to essential long-term medications represents a central public health problem (1). Numerous studies have demonstrated that patients do not adhere to medications as prescribed (2, 3), leading to excess hospitalizations, morbidity, mortality, and health care costs (4, 5). Improving adherence to essential medications has repeatedly been highlighted as a public health priority (6). However, important gaps remain in our understanding of the causes of nonadherence and the best ways to intervene to support appropriate medication use (7).

Most adherence research is conditional on a patient filling a prescription for a medication, and studies traditionally evaluate refill rates (using claims data), patient reports of subsequent medication use (using self-reported data), or rates of administration once a prescription has been filled (using electronic pill bottles) (8–10). These existing studies of refill rates cannot clearly determine whether a patient does not adhere to therapy because he or she has not followed up with the provider to receive a prescription refill, the provider has not written the prescription, the prescription was written but not delivered to the pharmacy, or the prescription was delivered to the pharmacy but never picked up (that is, abandoned).

Prescriptions abandoned at the pharmacy represent a potential opportunity to intervene and improve adherence. When abandoned, the prescription has been written by the physician and called into, faxed to, or electronically delivered to the pharmacy or hand-delivered by the patient. Some abandoned prescriptions may never be picked up, representing a missed opportunity for therapy, whereas other prescriptions abandoned may be purchased later at the same pharmacy or at another pharmacy, indicating a delay in treatment and pharmacy inefficiency.

Recent studies have used electronic prescribing data to assess rates of "primary nonadherence" (rates at which patients do not fill prescriptions written by physicians) (11, 12); however, we are aware of no previous studies evaluating the rates and predictors of prescription drug abandonment at retail pharmacies for commonly prescribed medications. To better understand the magnitude of the

See also:

Print
Editors' Notes 634
Editorial comment. 680
Summary for Patients. I-42

Web-Only
Appendix
Appendix Figures
CME quiz
Conversion of graphics into slides

Context

Failure to retrieve prescription medications at the pharmacy is one aspect of nonadherence to therapy.

Contribution

In this cross-sectional study, the percentage of prescriptions that were abandoned at the pharmacy was low. However, prescriptions for initial therapy, those for expensive drugs, those that required high copayments, and those delivered electronically were significantly more likely to be abandoned than others.

Implication

The increasing use of electronic prescribing may result in an increase in the number of prescriptions that patients fail to retrieve from the pharmacy. Physicians should be alert to factors associated with prescription abandonment.

—The Editors

problem and identify potential strategies to intervene to improve medication adherence, we merged a database from a large retail pharmacy chain with a database from a large pharmacy benefits manager (PBM). This merged data set provides a unique opportunity to assess rates and predictors of abandonment at a discrete point in the medication filling process, as well as subsequent use after abandonment at the same or other pharmacies.

METHODS

This study was approved by the institutional review boards of Partners Healthcare System, Boston, Massachusetts, and Harvard University, Cambridge, Massachusetts.

Data Sources

Retail pharmacy data were provided by CVS (Woonsocket, Rhode Island), a large national pharmacy chain. Pharmacy data contain all prescriptions (regardless of insurer), the mode of transmission (for example, electronic), and whether the script was bottled and then returned to stock (RTS). Insurance claims data were provided by Caremark (Woonsocket, Rhode Island), a large national PBM. The PBM data encompass all claims information either requested by the pharmacy or reimbursed by Caremark and include data from all pharmacies that a patient visited.

Study Period and Cohort Construction

All prescriptions filled and either purchased by a patient or abandoned (referred to here as "RTS") at CVS retail pharmacies were identified during a 3-month period from 1 July 2008 to 30 September 2008 (the identification period). The CVS consumers who receive pharmacy benefits through Caremark were then identified by matching retail transactional data to transactional data from the Caremark database. Among these individuals, all covered and filled prescriptions have a paid pharmacy claim in the Caremark database. Further data identifying the copayment charged before the prescription was filled (**Appendix Figure 1**, available at www.annals.org). CVS pharmacies generally return prescriptions to stock if they are not picked up within 14 days of delivering the prescription.

Electronic pharmacy data from the retail pharmacy and PBM were matched on pharmacy store number, prescription number, fill date, and patient ZIP code. We successfully matched 99.93% of retail transactions with PBM data. Transactional data from the retail pharmacy was used to determine whether a prescription was returned to stock, because these data more accurately reflect internal processes of the pharmacy than data provided by the PBM.

Pharmacy benefits manager claims from the baseline period, 6 months before the identification period (1 January 2008 to 30 June 2008), were used to determine whether prescriptions filled in the identification period were new prescriptions. We defined "new users" as patients who had filled no prescriptions in the same class as the index prescription in the 6 months before the index. Pharmacy benefits manager claims from a 3-month follow-up period, 1 October 2008 to 31 December 2008, were used to assess whether patients who abandoned prescriptions at the pharmacy subsequently filled those prescriptions at the same or another pharmacy. We excluded prescriptions at all CVS pharmacies that had automatic refill programs during the study period because abandonment rates were artificially high in these settings.

Outcomes

For each patient, the first prescription in a class during the identification period was considered the index prescription and the date on which it was written was considered the index date. We assigned each such prescription to 1 of 3 mutually exclusive outcomes: 1) filled prescription, indicating that the patient purchased the prescription; 2) RTS, indicating that the patient abandoned the prescription; or 3) RTS with fill, indicating that the patient abandoned the prescription and it was returned to stock, but the patient purchased a prescription for a medication in the same medication class at the same or another pharmacy. To determine RTS with fill status, we identified all RTS prescriptions and evaluated whether the patient filled a prescription for any medication in the class, determined by the first 4 digits of the Generic Product Index code of the abandoned prescription, from any pharmacy in the 30 days after the RTS fill date. This time frame was selected to conservatively estimate the clinical effect of abandonment. For patients with more than 1 prescription in a given class during the identification period, we considered only the first of these prescriptions so that we did not assign excessive weight to individuals with multiple abandoned prescriptions in the same class. For patients whose index RTS occurred in the first 2 weeks of the identification period, we also considered the prescription an RTS with fill if the patient filled a

14 days, because these patients were probably not without medication at the time of the RTS.

Characteristics of Patients and Prescriptions

A prescription was considered new if no other prescriptions in the medication class (determined by Generic Product Index codes) had been filled in the 6 months before the index date. For each index prescription, PBM data were used to identify the copayment charged, whether the prescription was for a generic or brand-name medication, whether the medication was for a chronic or acute condition, and the source of insurance coverage (Medicare, Medicaid, employer sponsored, health plan not through an employer, or cash card or other). We also identified whether the prescription was transmitted electronically (e-prescribed) to the pharmacy. Additional information was identified at the patient level: patient age, sex, and the number of unique medications filled in the identification period (a proxy for comorbidity) (13). The ZIP code of the patient's home residence was identified and linked to 2000 census tract data to assign the median income in the ZIP code of residence of each patient (14). We also used census thresholds to determine whether each patient lived in a rural or an urban area, on the basis of the population density of each ZIP code; rural neighborhood was defined as a population density of fewer than 1000 persons per square mile (15).

Statistical Analysis

We used descriptive statistics to summarize the characteristics of patients in our sample who filled prescriptions. We then assessed the proportion of prescriptions that were filled, RTS, and RTS with fill by medication class. Finally, we conducted bivariate and multivariate analyses to assess how patient- and prescription-level covariates were associated with RTS rates, by using generalized estimating equations to account for clustering at the patient level. Our statistical model was a generalized linear model with a log-link function that yielded estimates of relative risk. We estimated variable SEs robustly by using the empirical variance–covariance matrix to address patient-level clustering. Variables were estimated by using a working correlation matrix with an exchangeable structure.

In our bivariate analyses, we assessed the association among medication class, copayment, and brand-name versus generic drug on RTS probability and RTS with fill probability. Sensitivity analyses were conducted by excluding all electronic prescriptions. In the multivariate analysis that included all variables, we sought to understand predictors of true abandonment—that is, patients who did not subsequently refill a prescription—and combined all RTS with fill prescriptions with filled prescriptions. In this manner, our dichotomous outcome was RTS versus either a filled prescription or an RTS prescription with fill. We conducted sensitivity analyses that included total medica-

Table 1. **Patient Characteristics***

Characteristic	Data
Age, % (n)	
0–17 y	11.8 (617 041)
18–34 y	14.7 (770 208)
35–49 y	23.4 (1 229 463)
50–64 y	29.3 (1 538 709)
≥65 y	20.8 (1 092 739)
Sex, % (n)	
Female	60.1 (3 134 854)
Male	39.9 (2 079 784)
Urban or rural residence, % (n)	
Urban (≥1000 persons/mi^2)	68.1 (3 061 167)
Rural (<1000 persons/mi^2)	31.9 (1 435 886)
Insurance or payment type, % (n)	
Employer-sponsored	59.0 (3 099 450)
Cash card/other	4.9 (254 336)
Health plan	24.9 (1 304 744)
Medicare	6.7 (352 018)
Medicaid	4.6 (238 832)
Region, % (n)	
Northeast	35.1 (1 830 011)
West	6.9 (360 925)
South	42.2 (2 198 134)
Midwest	15.8 (824 603)
Other territories	0.0 (730)
Median family income in ZIP code, $	61 762.10 (25 349.90)
Mean unique prescriptions per patient (SD), n	2.0 (1.6)

* Based on a sample of 5 249 380 persons.

All analyses were performed by using SAS software, version 9.2 (SAS Institute, Cary, North Carolina).

Role of the Funding Source

The work was funded by grants from CVS Caremark and a career development award from the National Heart Lung and Blood Institute to Dr. Shrank. The authors retained independent and complete control over the design and implementation of the study as well as the analyses and writing of the manuscript.

RESULTS

Our cohort consisted of 10 349 139 index prescriptions filled by 5 249 380 patients during the identification period. Patients were an average of 47.3 years of age, and 60.1% were female. They filled 2.0 unique prescriptions during the identification period and lived in ZIP codes with an average median income of $61 762 (Table 1). Most patients had employer-sponsored insurance, yet a substantial number of patients were insured by Medicare, Medicaid, and non–employer-based health plans; approximately 4% used a cash card to receive discounted medica-

tions, which probably indicates that they did not have pre-

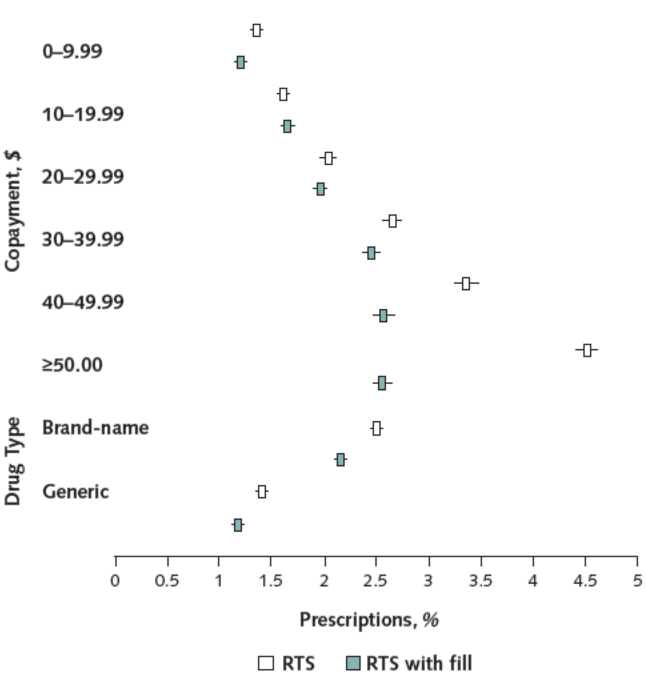
Table 2. **Rates of Prescription Fill, RTS, and RTS With Fill, by Drug Class**

Drug Class	Prescription Status					
	Filled		RTS		RTS With Fill*	
	Percentage (95% CI)	Number	Percentage (95% CI)	Number	Percentage (95% CI)	Number
Opiate	98.2 (98.1–98.2)	671 488	1.0 (1.0–1.0)	6850	0.9 (0.8–0.9)	5800
Antihypertensive	97.6 (97.5–97.6)	626 631	1.1 (1.1–1.1)	7160	1.3 (1.3–1.4)	8585
Antidepressant	97.0 (96.9–97.0)	443 230	1.4 (1.4–1.5)	6591	1.6 (1.5–1.6)	7176
Statin	97.3 (97.2–97.3)	394 908	1.4 (1.4–1.4)	5654	1.3 (1.3–1.4)	5432
Proton-pump inhibitor	95.6 (95.5–95.7)	250 969	2.6 (2.5–2.7)	6817	1.8 (1.8–1.9)	4817
Diabetes medication						
Oral	97.0 (96.9–97.0)	198 272	1.3 (1.2–1.3)	2614	1.8 (1.7–1.8)	3586
Insulin	94.9 (94.8–95.1)	62 814	2.2 (2.1–2.4)	1482	2.9 (2.7–3.0)	1884
Antibiotic	98.0 (98.0–98.1)	933 701	1.3 (1.3–1.3)	12 131	0.7 (0.7–0.7)	6719
Dermatologic agent	94.6 (94.5–94.7)	477 415	3.0 (2.9–3.0)	15 011	2.4 (2.4–2.5)	12 249
Asthma medication or inhaler	94.4 (94.3–94.5)	339 009	3.5 (3.4–3.6)	12 595	2.1 (2.1–2.2)	7551
Hormone replacement therapy or oral contraceptive	96.9 (96.9–97.0)	326 478	1.3 (1.3–1.3)	4368	1.8 (1.8–1.8)	6032
Antiepileptic	96.4 (96.3–96.4)	200 772	1.7 (1.7–1.8)	3630	1.9 (1.8–2.0)	3956
Cough, cold, or allergy medication	95.1 (95.0–95.3)	132 529	3.6 (3.5–3.7)	4942	1.3 (1.3–1.4)	1824
Osteoporosis medication	96.5 (96.4–96.6)	77 134	1.7 (1.6–1.8)	1346	1.8 (1.7–1.9)	1446
Antipsychotic	95.5 (95.3–95.6)	71 666	2.3 (2.2–2.5)	1754	2.2 (2.1–2.3)	1665
Antiplatelet or anticoagulant	97.8 (97.7–97.9)	59 782	1.0 (0.9–1.1)	611	1.2 (1.1–1.3)	738
Prostate medication	97.5 (97.4–97.7)	51 659	1.3 (1.2–1.4)	679	1.2 (1.1–1.3)	635

RTS = returned to stock.
* Prescription was RTS but was subsequently filled at the same or another pharmacy.

Approximately 3.27% of all index prescriptions (0.34 million prescriptions) were abandoned; 1.77% of those prescriptions were RTS, and no prescription was filled by the same patient for a medication in the same class in the subsequent 30 days at any pharmacy (RTS), whereas 1.50% were filled at some pharmacy in that time frame (RTS with fill).

Figure. **Bivariate relations between prescription cost or brand-name or generic status and rates of abandonment.**



Abandonment rates varied by medication class (Table 2). Opiates and antiplatelet medications were least likely to be RTS prescriptions (1.0% and 0.9%, respectively) or RTS with fill (0.8% and 1.1%). Antihypertensives, oral diabetic medications, and statins also had comparatively low abandonment rates. Among daily-use therapies, higher rates of RTS were seen for proton-pump inhibitors (2.6%), asthma medications (3.5%), and insulin (2.2%). Medications used on an as-needed basis, such as dermatologic agents (RTS rate, 2.9%) and cough and cold medications (RTS rate, 3.6%) were also abandoned more commonly.

In bivariate analyses, the copayment charged was strongly associated with rates of abandonment. Prescriptions with copayments of less than $10 were abandoned 1.4% of the time, and abandonment rates increased consistently to 4.5% for copayments greater than $50 (Figure). Similarly, abandonment rates were greater for brand-name medications than for generic medications (Figure).

These relationships were confirmed in our multivariate models that included all variables being studied. When we compared the associations between prescription- and patient-level variables and true prescription abandonment (RTS with no subsequent fills), medication copayment was most strongly associated with abandonment rates. Compared with prescriptions with no copayment, prescriptions with copayments of $40.01 to $50.00 had a 3.40 times greater probability of being abandoned, and prescriptions costing more than $50.01 had a 4.68 times greater probaparisons with the referent category) (**Table 3**). Similarly, median income in ZIP code of residence was significantly associated with abandonment rates; patients living in ZIP codes in the highest income quintile were 21% less likely to abandon prescriptions ($P < 0.001$). Medicaid beneficiaries were 8% more likely to abandon prescriptions than were persons with employer-sponsored health insurance.

Young adults aged 18 to 34 years were most likely to abandon prescriptions. Seniors were 45% less likely to abandon prescriptions than young adults ($P < 0.001$). Patients with more comorbid conditions were more likely to abandon prescriptions; each additional unique prescription medication filled was associated with a 4% increase in the probability of abandonment ($P < 0.001$).

New users of medications had more than 2.74 times greater probability of abandonment than prevalent users, and maintenance medications had slightly less probability of being abandoned ($P < 0.001$ for both comparisons). Of note, prescriptions delivered electronically to the pharmacy had a 64% increase in the probability of being abandoned compared with those that were not electronically delivered ($P < 0.001$).

DISCUSSION

To our knowledge, ours is the first study to comprehensively evaluate the phenomenon of prescriptions abandoned at the pharmacy. We found that 3.27% of prescriptions bottled at the pharmacy were abandoned and RTS, and on more than half of those occasions, the patient did not fill an alternate prescription for the same medication at any pharmacy. This represents a relatively small proportion of all prescriptions that are filled at pharmacies, comprising a small component of overall medication nonadherence or failure to appropriately use long-term medications. However, the total number of abandoned prescriptions in the population is great, and every essential prescription abandoned could represent an important clinical concern if the patient does not subsequently restart the medication or identify a substitute. Moreover, the likelihood of abandonment for patients who fill multiple medications can be substantial and clinically important.

By evaluating prescription abandonment rates, we assess a discrete event in the continuum of the prescription drug delivery process that may represent an opportunity to intervene and support better medication adherence. Physicians or pharmacists should be aware of the patient and prescription characteristics associated with higher rates of abandonment to assist patients to improve medication use. We have created a simple prediction rule with 4 covariates that providers can use to rapidly assess risk and to best identify who may benefit most from additional counseling or the selection of a less expensive medication (**Appendix** and **Appendix Figure 2**, available at www.annals.org).

Copayments charged to patients were the strongest

Table 3. **Multivariate-Adjusted Associations Between Patient and Prescription Characteristics and Rates of Abandonment**

Characteristic	Prescriptions, *n**	Unadjusted Frequency of RTS, %	Relative Risk (95% CI)†
Age			
18–34 y	1 222 000	2.4	1.00 (reference)
0–17 y	954 000	2.4	0.98 (0.96–1.00)
35–49 y	2 270 000	2.0	0.87 (0.86–0.89)
50–64 y	3 278 000	1.5	0.65 (0.64–0.66)
≥65 y	2 622 000	1.4	0.55 (0.54–0.56)
Sex			
Female	6 183 000	1.8	1.00 (reference)
Male	4 101 000	1.6	0.88 (0.87–0.89)
Urban or rural residence			
Urban (≥1000 persons/mi^2)	5 919 000	1.7	1.00 (reference)
Rural (<1000 persons/mi^2)	2 917 000	1.7	0.95 (0.94–0.96)
Insurance or payment type			
Employer-sponsored	6 000 000	1.8	1.00 (reference)
Cash card/other	499 000	2.7	1.01 (0.98–1.03)
Health plan	2 424 000	1.6	0.83 (0.81–0.84)
Medicare	945 000	1.2	0.96 (0.94–0.99)
Medicaid	480 000	2.3	1.08 (1.04–1.12)
Income			
$0–$41 094	1 876 000	1.9	1.00 (reference)
$41 095–$51 393	1 851 000	1.8	0.93 (0.92–0.95)
$51 394–$63 972	1 790 000	1.7	0.90 (0.88–0.91)
$63 973–$80 330	1 698 000	1.7	0.86 (0.84–0.87)
$80 331–$200 001	1 610 000	1.6	0.79 (0.77–0.80)
Number of unique prescriptions per patient	–	–	1.04 (1.04–1.05)
Copayment			
$0	824 000	1.5	1.00 (reference)
$0.01–$10.00	5 759 000	1.3	1.21 (1.17–1.25)
$10.01–$20.00	1 435 000	1.6	1.58 (1.53–1.63)
$20.01–$30.00	1 028 000	2.0	2.05 (1.98–2.12)
$30.01–$40.00	239 000	2.6	2.60 (2.51–2.69)
$40.01–$50.00	247 000	3.4	3.40 (3.27–3.54)
≥$50.01	527 000	4.5	4.68 (4.53–4.84)
Prescription delivery method			
Not electronic	9 928 000	1.7	1.00 (reference)
Electronic	421 000	2.3	1.64 (1.60–1.67)
New user			
No	4 190 000	0.9	1.00 (reference)
Yes	6 159 000	2.4	2.74 (2.70–2.78)
Maintenance drug			
No	3 980 000	1.9	1.00 (reference)
Yes	6 369 000	1.7	0.97 (0.96–0.98)

RTS = returned to stock.
* Includes prescriptions that were filled, RTS, and RTS with fill.
† Results from a multivariate model that includes all variables listed in the table. The 95% CIs are based on robust SEs that account for clustering at the patient level; the dichotomous outcome is RTS vs. filled prescription or RTS with fill.

rience "sticker-shock" at the pharmacy and choose not to fill those prescriptions. Improved physician awareness of

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