Distance to pharmacy and risk of medication primary nonadherence

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Abstract

Primary nonadherence, a form of prescription nonadherence, is defined as failure to fill and pick up a prescription medication. Little is known about the relationship between distance to pharmacy and primary nonadherence in dermatology. In this study, we investigated the association between primary nonadherence and distance between a patient's home and pharmacy. We focused on a low-income patient population within the dermatology clinic of a large, urban county hospital system in which patients were enrolled in a pharmacy benefit within a closed-system. Among 678 patients who were prescribed a total of 1156 prescription medications for dermatologic conditions, 11.7% did not pick up any of their prescriptions. After adjusting for patient demographics of race/ethnicity, sex, age, language, and relationship status, there was no association between primary nonadherence and distance traveled between a patient's home and pharmacy. Results of this study are consistent with other studies in non-dermatologic patients and suggtableest that distance from a pharmacy may not be strongly associated with primary nonadherence for dermatologic medications.

Keywords: primary nonadherence, adherence, distance, pharmacy

Introduction

Prescription medications are an important part of effectively treating many dermatologic disorders. Nonadherence to prescriptions can lead to poorer patient outcomes. One form of nonadherence is primary nonadherence, defined as nonadherence due to failure to fill and pick up a prescription medication [1]. Previous studies have established associations between primary nonadherence in dermatology patients and factors such as method of prescription [2] and number of prescriptions [1]. However, little is known about how geographic factors, such as distance between a patient's home and pharmacy, can influence primary nonadherence.

Intuitively, it may seem that increased distance between a patient's home and pharmacy may adversely affect primary adherence. Although this geographic distance association has not been studied explicitly among dermatology patients, a study found that patients commonly reported "lack of time" as a reason for primary nonadherence [3]. Presumably this lack of time may be related to distance travelled to the pharmacy. Identifying factors that increase the likelihood of primary nonadherence is important because nonadherence is a public health issue associated with increased system costs, hospital admissions, morbidity, and mortality [4]. In this study of patients in a large, urban county hospital system, we explore the relationship

between primary nonadherence, and distance between a patient's home and pharmacy.

Methods

The population of this study was new patients of the dermatology clinic at Parkland Health and Hospital System (PHHS), a large, public hospital system in Dallas, Texas. New patients were identified as having been seen between January 1, 2011 and December 31, 2013 and having had no visits in the prior 3 years. Additional inclusion criteria were having one or more formulary dermatologic medications prescribed and insurance coverage under Parkland Health Plus (PHP), a publicly-funded insurance program for uninsured and low-income residents of Dallas County, Texas. PHP patients can fill and pick up subsidized prescription medications at any of seven PHHS-affiliated pharmacies located across Dallas County, including two on the PHHS main campus where the dermatology clinic is located. Patient demographic information such as sex, age, primary language, self-reported race/ethnicity, and relationship status were extracted from the PHHS electronic medical record (EMR).

Prescriptions could be sent to the pharmacy electronically through the EMR or printed, though the EMR only records location of prescription pick up if the prescription was sent electronically. Therefore, we excluded paper prescriptions in our analysis. There are two pharmacies located on the PHHS main campus where patients could fill and pick up their medication the same day as their clinic visit and not have to travel any distance for primary adherence. We excluded all patients who picked up prescriptions at these two pharmacies the same day as their clinic visit. Street distance between patient's home and pharmacy pick up location was calculated using distance by roadway from patient's home ZIP Code centroid to pharmacy street address. Driving time was calculated for non-traffic hours along the same street distance using ArcGIS (Redlands, CA).

We defined primary nonadherence as not filling and picking up all prescriptions within one year of the date on which the prescriptions were written. Adherence was stratified by full adherence (filling and picking up all prescriptions) or some adherence (filling and picking up some prescriptions), and complete nonadherence (filling and picking up no prescriptions). We grouped some adherence and full adherence together as we were most concerned if the patients physically made it to the pharmacy at all.

Associations between patient characteristics and adherence groups were assessed using Mantel-Haenszel general association tests. Covariate adjusted risk ratios (RRs) and 95% confidence intervals (CIs) were calculated for complete nonadherence comparing categories of distance traveled using log-binomial regression models. Statistical analysis was performed using SAS version 9.3 (Cary, NC). This study was approved by the University of Texas Southwestern Medical School Institutional Review Board. Owing to the retrospective nature of the study, consent was not necessary. A data use agreement was also approved for use at the University of North Carolina at Chapel Hill.

Results: A total of 678 patients met the inclusion criteria and were prescribed a total of 1156 medications for dermatologic conditions, a mean of 1.7 prescriptions per patient (**Table 1**). Women made up 66.1% of patients. The mean (SD) age of all patients was 48.4 (13.2) years. Most patients spoke English as a primary language at 59.3%, followed by Spanish at 36.3%. Consistent with the population served by PHHS, 47.9% of patients were Hispanic, 24.0% were black, 20.4% were white, and 7.7% were another race/ethnicity. Overall complete nonadherence was 11.7%. Patient and pharmacy associated factors did not differ between the some/full adherence group and the complete nonadherence group.

After adjusting for patient demographics of race/ethnicity, sex, age, language, and relationship status, there was no difference in risk of nonadherence based upon street distance to pharmacy (**Table 2**). Furthermore, there was no association between increased driving time to pharmacy and nonadherence.

Discussion

In this study of primary nonadherence, overall complete nonadherence was 11.7%. We originally hypothesized that increased street distance and driving time between a patient's home ZIP Code centroid and pharmacy would increase risk of primary nonadherence. However, we found no such relationship even after adjusting adherence for patient demographic characteristics including race/ethnicity, sex, age, language, and relationship status.

The population of this study consisted primarily of low-income patients who may live in pharmacy deserts, geographic areas in which physical access to pharmacies is limited [5]. Although adherence of patients who live in pharmacy deserts might be influenced by street distance and driving time to

Table 1. *Patient characteristics, N (%), (n=678).*

	All patients	Some or full adherence (n=599)	Complete nonadherence (n=79)	p-value*
Sex				
Male	230 (33.9)	207 (34.6)	23 (29.1)	0.34
Female	448 (66.1)	392 (65.4)	56 (70.9)	
Mean age, years (SD)	48.4 (13.2)	48.7 (13.2)	46.7 (13.0)	0.21
Age, categories				
<30 years	52 (7.7)	44 (7.4)	8 (10.1)	0.62
30-49 years	301 (44.4)	263 (43.9)	38 (48.1)	
50-69 years	300 (44.3)	270 (45.1)	30 (38.0)	
70+ years	25 (3.7)	22 (3.7)	3 (3.8)	
Primary language				
English	402 (59.3)	356 (59.4)	46 (58.2)	0.68
Spanish	246 (36.3)	218 (36.4)	28 (35.4)	
Other	30 (4.4)	25 (4.2)	5 (6.3)	
Race/ethnicity				
Non-Hispanic White	138 (20.4)	121 (20.2)	17 (21.5)	0.95
Hispanic White	325 (47.9)	289 (48.3)	36 (45.6)	
Black	163 (24.0)	144 (24.0)	19 (24.1)	
Other	52 (7.7)	45 (7.5)	7 (8.9)	
Relationship status				
In relationship	286 (42.2)	252 (42.1)	34 (43.0)	0.87
Not in relationship	392 (57.8)	347 (57.9)	45 (57.0)	
On campus pharmacy				
Yes	349 (51.5)	309 (51.6)	40 (50.6)	0.87
No	329 (48.5)	290 (48.4)	39 (49.4)	
Street distance				
0-4 miles	189 (27.9)	170 (28.4)	19 (24.1)	0.12
5-9 miles	209 (30.8)	191 (31.9)	18 (22.8)	
10-14 miles	173 (25.5)	144 (24.0)	29 (36.7)	
15-19 miles	92 (13.6)	80 (13.4)	12 (15.2)	
20 or greater miles	15 (2.2)	14 (2.3)	1 (1.3)	
Driving time				
0-4 min	78 (11.5)	70 (11.7)	8 (10.1)	0.66
5-9 min	121 (17.9)	110 (18.4)	11 (13.9)	
10-14 min	237 (35.0)	211 (35.2)	26 (32.9)	
15-19 min	147 (21.7)	126 (21.0)	21 (26.6)	
20 or greater min	95 (14.0)	82 (13.7)	13 (16.5)	

*Mantel-Haenszel general association test for differences between some or full adherence and complete nonadherence groups.

Table 2. *Adherence by distance and travel time and adjusted risk ratios for complete nonadherence (n=678).*

Street distance in miles	Complete nonadherence	Some or full adherence	Adjusted risk ratios*
0-4 miles (n=189)	19 (10.1)	170 (90.0)	Reference
5-9 miles (n=209)	18 (8.6)	191 (91.4)	0.83 (0.44, 1.54)
10-14 miles (n=173)	29 (16.8)	144 (83.2)	1.67 (0.97, 2.86)
15-19 miles (n=92)	12 (13.0)	80 (87.0)	1.30 (0.66, 2.58)
20 or greater miles (n=15)	1 (6.7)	14 (93.3)	0.67 (0.10, 4.65)
Driving time in minutes			
0-4 min (n=78)	8 (10.3)	70 (89.7)	Reference
5-9 min (n=121)	11 (9.1)	110 (90.9)	0.91 (0.38, 2.18)
10-14 min (n=237)	26 (11.0)	211 (89.0)	1.06 (0.50, 2.27)
15-19 min (n=147)	21 (14.3)	126 (85.7)	1.42 (0.65, 3.08)
20 or greater min (n=95)	13 (13.7)	82 (86.3)	1.34 (0.58, 3.09)

*Adjusted for patient race/ethnicity, sex, age, language, and relationship status.

pharmacies, the outcome of this study has not shown evidence of association. This is consistent with a study of Medicaid patients in Illinois, which also found no association between distance to pharmacy and prescription adherence [6]. Furthermore, a systematic review of 108 studies showed that the impact of travel time and distance to healthcare facilities was equivocal [7]. One reason for this unexpected incongruence could be that availability of and access to transportation is more important than distance, and that access to convenient transportation may negate the effects of increased distance. For reference, the Dallas-Fort Worth-Arlington, Texas metropolitan area ranks in the top 35% of 290 urbanized areas with populations over 65,000 in terms of public transit ridership per capita [8]. Additionally, patients may be filling and picking up prescriptions at pharmacies that are closer to places of employment or along commuting routes [9]. However, this study focused on identifying the association between adherence and distance and not the reasons why distance does not affect adherence.

Some limitations of this study include generalizability owing to the unique insurance and demographic characteristics of the study population. Patients included in this study were low-income and exclusively insured by PHP Insurance. Thus, the patients were limited to selecting from five subsidized pharmacies in Dallas County, Texas. The demographics of the study population, which included 66.1% female patients, 47.9% Hispanic patients, and 24% black patients, may not be representative of other dermatology practice populations. Another limitation of this study is the exclusion of paper prescriptions, which constituted the majority of prescriptions [2]. It is also possible that type of medication prescribed or other unmeasured confounding factors could have affected adherence [10, 11]. Finally, distance between patient's home and pharmacy was calculated using a ZIP Code centroid, which is not wholly representative of a patient's actual home address.

This study shows that among low-income patients in an urban setting, distance between a patient's home and pharmacy was not associated with prescription medication primary nonadherence. Further work is needed to continue identifying factors that influence primary nonadherence.

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