Adherence to Chronic Disease Medications among New York City Medicaid Participants

Kelly A. Kyanko, Robert H. Franklin, and Sonia Y. Angell

ABSTRACT Medication adherence is critical for cardiovascular disease prevention and control. Local health departments are well positioned to address adherence issues, however relevant baseline data and a mechanism for monitoring impact of interventions are lacking. We performed a retrospective analysis using New York State Medicaid claims from 2008 to 2009 to describe rates and predictors of adherence among New York City Medicaid participants with dyslipidemia, diabetes, or hypertension. Adherence was measured using the medication possession ratio, and multivariable logistic regression was used to assess factors related to adherence. Medication regimen adherence was 63%. Greater adherence was observed in those who were older, male, and taking medications from ≥ 3 drug classes. Compared with whites, blacks and Hispanics were less likely to be adherent (adjusted odds ratio [OR]=0.67, 95% confidence interval [CI]: 0.65–0.70 and adjusted OR=0.76, 95% CI: 0.73–0.78, respectively), while Asians were as likely. Medication adherence was inadequate and racial disparities were identified in NYC Medicaid participants on stable medication regimens for chronic disease. This study demonstrates a claims-based model that may be used by local health departments to monitor and evaluate efforts to improve adherence and reduce disparities.

KEYWORDS Medication adherence, Health disparities, Cardiovascular prevention, Public health

INTRODUCTION

Adherence to medications for hypertension, diabetes, and dyslipidemia is a critical component of cardiovascular disease (CVD) prevention and control. Non-adherence is associated with higher costs of care, and increased hospitalizations and deaths.¹ Recognized adherence barriers include regimen complexity and factors related to medication dispensing, such as the quantity of medication dispensed per fill^{2,3} and the number of pharmacy visits required monthly.⁴ Systems-level approaches to improve adherence exist but have been employed largely by individual health care delivery organizations,⁵ or by payors such as managed care plans or Medicare/Medicaid medication therapy management programs.^{6,7} Local health departments can play a unique role, identifying and promoting best practices across systems with

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the scale needed for population impact, however feasible mechanisms of surveillance to monitor and evaluate impact are needed.

In collaboration with the New York State (NYS) Department of Health, the New York City (NYC) Health Department developed a state Medicaid claims-based method to assess adherence among NYC Medicaid participants, and to guide potential future interventions. We describe this method and baseline findings of rates and predictors of medication adherence among those with chronic disease on maintenance medications, and describe the quantity of medication dispensed for prescriptions filled.

METHODS

Study Population and Data Source

A retrospective analysis was performed using the NYS Department of Health's Medicaid claims database. Included were NYC residents, ages 20–64 years, continuously enrolled in Medicaid and with dyslipidemia, diabetes, and/or hypertension. A participant was considered to have a condition if s(he) filled a prescription for a drug class for the condition within the observation period, July 1, 2008–June 30, 2009. Exclusion criteria included dual Medicaid–Medicare eligibility, unknown sex, any visit during the eligibility period for pregnancy or labor and delivery, nursing home or hospice residency, or continuous hospital stay of ≥ 30 days. Because of favorable NYS Medicaid co-pay policies, it is unlikely that a substantial number of prescriptions were filled outside the program.⁸

Adherence Measure, Predictors of Adherence, and Drug Classes of Interest

Adherence was determined for drug classes rather than individual medications to minimize underestimation of adherence due to switching medications within a class. The variables “drug name”, “date dispensed”, and “days supply” were used to create the adherence measure, the medication possession ratio (MPR), using methodology from Steiner et al.^{8,9} This validated method calculates the ratio of number of days supply dispensed divided by the days between the first and last fill dates during the observation period. Therefore, at least two fills of an eligible medication were required. To identify maintenance medications, or those intended for long-term use, an eligible medication also needed to be filled at least once in the 3 months prior to the observation period. Hospital stays were accounted for. Adherence was calculated for each drug class, and then a weighted average was calculated for each participant.

Predictors of adherence included the variables: sex, race/ethnicity, and age; number of chronic conditions (one, two, or three, limited to the three chronic conditions of interest); and number of drug classes (one, two, three or more), because number of medications taken per day has been shown to influence adherence.^{10,11}

Table 1 lists medication classes included. Injectable and powder medications were excluded because the days supply reported may not accurately reflect true usage. Also excluded were hypertension medications commonly used for other indications, such as potassium-sparing diuretics or clonidine, and last line medications such as vasodilators (e.g., hydralazine).

TABLE 1 Drug classes included in analysis

Hypertension	Diabetes	Dyslipidema
ACE inhibitors	Biguanides	Statins
Beta blockers	DPP4 inhibitors	Niacin
Calcium channel blockers	Thiazolidinediones	Fibrates
Thiazide diuretics	Sulfonylureas	Bile acid sequestrants
Angiotensin receptor blockers	Combination drugs	Cholesterol absorption inhibitors
Combination drugs		Combination drugs

Quantity of medication dispensed was calculated using “days supply”, and categorized as 30, 60, 90 days, or “other”.

Statistical Analyses

The MPR was dichotomized (adherent, non-adherent). A participant was “adherent” if the MPR was >80 %, based on established literature.¹² All predictors were categorical; bivariate analyses were performed using χ^2 tests. Multivariable logistic regression was performed. All analyses were performed by the NYS Department of Health on secure servers using SAS statistical software version 9.2 (SAS Institute, Inc., Cary, NC, USA). The study was determined to not be human subjects research

TABLE 2 Baseline characteristics of participant population

	N	%
Total	160,236	
Age (years)		
20–34	5,889	3.7
35–49	47,911	29.9
50–64	106,436	66.4
Sex		
Female	95,119	59.4
Male	65,117	40.6
Race/ethnicity		
White	21,411	13.4
Black	36,329	22.7
Hispanic	60,552	37.8
Asian/Pacific Islander	24,626	15.4
Native American	665	0.4
Other	12,252	7.7
Unknown	4,401	2.8
No. of drug classes		
One	55,181	34.4
Two	44,970	28.1
Three or more	60,085	37.5
No. of conditions		
One	85,206	53.2
Two	53,772	33.6
Three	21,258	13.3

Numbers may not sum to total due to missing data, and percentages may not sum to 100 % due to rounding

by the NYC Department of Health and Yale Institutional Review Boards, as the investigators at these institutions only had access to summary-level data.

RESULTS

A total of 160,236 participants and over 3.5 million prescription fills were included in the analyses. Single fills resulted in exclusion of 5,414 participants. Table 2 shows study population baseline characteristics. Of the population, 66.4 % were ages 50–64 years, and 59.4 % were female. Hispanics represented 37.8 % of the population, followed by blacks, Asian/Pacific Islanders, and whites. Half (53.2 %) had only one of the three conditions.

Overall, 62.8 % were adherent. Table 3 compares adherence rates by participant characteristics. All bivariate associations were significant at $p<0.0001$, with greater adherence observed in participants who were older, male, taking medications from three or more drug classes, and with all three conditions. Blacks and Hispanics had lower adherence.

TABLE 3 Participant characteristics stratified by adherence and associated with adherence

Characteristic	Unadjusted bivariate comparisons		Adjusted logistic regression ^a
	Non-adherent ^b N (%)	Adherent N (%)	Odds ratio (95 % CI)
Total	59,615 (37.2)	100,621 (62.8)	–
Age			
20–34	2,830 (48.1)	3,059 (51.9)	0.60 (0.57–0.63)
35–49	20,351 (42.5)	27,560 (57.5)	0.74 (0.72–0.75)
50–64	36,434 (34.2)	70,002 (65.8)	1.00 (ref)
Sex			
Female	36,321 (38.2)	58,798 (61.8)	0.93 (0.91–0.95)
Male	23,294 (35.8)	41,823 (64.2)	1.00 (ref)
Race/Ethnicity			
White	6,960 (32.5)	14,451 (67.5)	1.00 (ref)
Black	15,456 (42.5)	20,873 (57.5)	0.67 (0.65–0.70)
Hispanic	23,613 (39.0)	36,939 (61.0)	0.76 (0.73–0.78)
Asian/Pacific Islander	7,639 (31.0)	16,987 (69.0)	1.09 (1.05–1.13)
Native American	241 (36.2)	424 (63.8)	0.86 (0.73–1.01)
Other	4,597 (37.5)	7,655 (62.5)	0.82 (0.78–0.86)
Unknown	1,109 (25.2)	3,292 (74.8)	1.42 (1.32–1.53)
No. of drug classes			
One	22,213 (40.3)	32,968 (59.8)	0.77 (0.75–0.79)
Two	17,224 (38.3)	27,746 (61.7)	0.83 (0.81–0.85)
Three or more	20,178 (33.6)	39,907 (66.4)	1.00 (ref)
No. of conditions			
One	34,046 (40.0)	51,160 (60.0)	–
Two	18,961 (35.3)	34,811 (64.7)	–
Three	6,608 (31.1)	14,650 (68.9)	–

Numbers may not sum to total due to missing data
All bivariate comparisons and odds ratios significant with $p<0.0001$ except for Native American race/ethnicity
^aC-statistic for model: 0.58. “Number of conditions” was excluded from the model as this variable was collinear with “Number of drug classes”.
^bNon-adherent defined as <80 % MPR, Adherent >80 % MPR

In multivariable logistic regression (Table 3), “number of conditions” was excluded from the model because the variable was collinear with “number of drug classes” (Spearman correlation coefficient=0.76). Compared with whites, blacks and Hispanics were less likely to be adherent (adjusted odds ratio [OR]=0.67, 95 % confidence interval [CI]: 0.65–0.70 and adjusted OR=0.76, 95 % CI: 0.73–0.78, respectively), while Asians were as likely. Younger age, female sex, and taking only one or two medications were associated with decreased odds of adherence. The majority of prescriptions filled were for a 30-day supply, rather than 60 or 90 days or “other” (95.9 %, 0.6 %, 2.5 % and 1.0 %, respectively).

DISCUSSION

Adherence to chronic disease medications in a population of NYC Medicaid participants was 63 %. Although similar to estimates in other populations,^{13,14} it is grossly inadequate. As NYS Medicaid participants have the advantage of a non-required small co-pay for medications, our findings are with cost — a known barrier to adherence¹³ — already eliminated. Also, because our study was designed to select for a Medicaid population on maintenance medications, adherence is expected to be even lower in the overall Medicaid population.

Consistent with prior studies,^{15–18} blacks and Hispanics were observed to be less adherent as compared with whites, potentially contributing to related health outcomes disparities. This study also provided a unique opportunity to describe adherence amongst Asians, which was found to be similar to whites.

Study limitations include that the analysis did not control for health status, number of medications, or comorbidities outside of three conditions of interest. Although we were unable to control for education or income, we expect limited heterogeneity for these characteristics because all participants qualified for Medicaid, a needs-based program.

Medicaid claims datasets have traditionally been used for research in medication adherence. This study demonstrates a method for use by public health departments to promote action. It can be used to identify potential interventions, and when replicated over time, can assess best practices, and inform dissemination plans. For example, in this analysis we observed very low rates of larger prescription fills (~3 %). Since dispensing >30 days’ supply for maintenance medications is associated with increased adherence,^{2,3} future systems-level initiatives could focus on identifying and correcting related pharmacy or prescriber barriers, such as changing electronic health record 30-day default settings for quantity dispensed. Public health departments are well placed to address adherence rates and reduce disparities by working across local provider systems. This simple method of assessing adherence can guide related efforts and improve health outcomes.

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