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Association of Rideshare-Based Transportation Services and Missed Primary Care Appointments
A Clinical Trial

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IMPORTANCE Transportation barriers contribute to missed primary care appointments for patients with Medicaid. Rideshare services have been proposed as alternatives to nonemergency medical transportation programs because of convenience and lower costs.

OBJECTIVE To evaluate the association between rideshare-based medical transportation and missed primary care appointments among Medicaid patients.

DESIGN, SETTING, AND PARTICIPANTS In a prospective clinical trial, 786 Medicaid beneficiaries who resided in West Philadelphia and were established primary care patients at 1 of 2 academic internal medicine practices located within the same building were included. Participants were allocated to being offered complimentary ride-sharing services (intervention arm) or usual care (control arm) based on the prescheduled day of their primary care appointment reminder. Those scheduled on even-numbered weekdays were in the intervention arm and on odd-numbered weekdays, the control arm. The primary study outcome was the rate of missed appointments, estimated using an intent-to-treat approach. All individuals receiving a phone call reminder were included in the study sample, regardless of whether they answered their phone. The study was conducted between October 24, 2016, and April 20, 2017.

INTERVENTIONS A model of providing rideshare-based transportation was designed. As part of usual care, patients assigned to both arms received automated appointment phone call reminders. As part of the study protocol, patients assigned to both arms received up to 3 additional appointment reminder phone calls from research staff 2 days before their scheduled appointment. During these calls, patients in the intervention arm were offered a complimentary ridesharing service. Research staff prescheduled rides for those interested in the service. After their appointment, patients phoned research staff to initiate a return trip home.

MAIN OUTCOMES AND MEASURES Missed appointment rate (no shows and same-day cancellations) in the intervention compared with control arm.

RESULTS Of the 786 patients allocated to the intervention or control arm, 566 (72.0%) were women; mean (SD) age was 46.0. (12.5) years. Within the intervention arm, 85 among 288 (26.0%) participants who answered the phone call used ridesharing. The missed appointment rate was 36.5% (144 of 394) for the intervention arm and 36.7% (144 of 392) for the control arm (P = .96).

CONCLUSIONS AND RELEVANCE The uptake of ridesharing was low and did not decrease missed primary care appointments. Future studies trying to reduce missed appointments should explore alternative delivery models or targeting populations with stronger transportation needs.

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Supplemental content

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Low-income patients frequently face transportation barriers when accessing primary care. In several large surveys, 24% to 51% respondents reported missing or rescheduling an outpatient appointment because of unreliable transportation.[1,2] When faced with transportation barriers, patients shift their care toward more costly, acute care settings for low-acuity needs because of preference and convenience.[2-8] For health care professionals, missed appointments have a negative effect on clinical productivity.[2-4,9] Unused clinical space and staff time equate to lost revenue.

Nonemergency medical transportation (NEMT) is a Medicaid benefit provided to decrease transportation barriers. However, despite the availability of NEMT services, transportation barriers persist for many Medicaid patients.[10-12] The design of NEMT services may be a contributor: the services require advanced scheduling (often days in advance), travel times can be long due to indirect travel routes related to picking up and dropping off other passengers, and pick-up wait times can be long.[10] Rideshare services provided by companies such as Uber and Lyft have been proposed as NEMT alternatives because they can be scheduled as needed, use direct routes, are readily available in most urban areas, and cost less.[13-15]

We developed a model for providing rideshare-based transportation using a web-based rideshare dispatch platform provided by Lyft Inc. We tested the association between this rideshare-based transportation service model and the rate of missed appointments for Medicaid patients at 2 primary care practices in Philadelphia, Pennsylvania.

Key Points

Question What is the association between offering rideshare-based transportation services and missed appointment rates for primary care patients?

Findings In this pragmatic clinical trial that included 786 adults with Medicaid, the missed appointment rate was not significantly different between patients offered rideshare-based transportation services compared with controls.

Meaning Offering a rideshare-based transportation service may not decrease missed primary care appointments; targeting populations with specific transportation needs or delivering rideshare services in alternative ways warrants further testing.

Methods

Overview

We conducted a prospective clinical trial between October 24, 2016, and April 20, 2017, using a fixed allocation scheme to test the association between offering a rideshare-based transportation service (referred to as *Lyft ride*) and missed primary care appointments for Medicaid patients at 2 primary care practices. The trial protocol is available in Supplement 1. The practices were academic general internal medicine clinics that are part of Penn Medicine (University of Pennsylvania) and located in Philadelphia. The primary hypothesis was that the rate of missed appointments among those allocated to the intervention arm would be lower than the rate of missed appointments among comparable controls. We allocated patients into the intervention or control arm based on day of the week of a prescheduled phone appointment reminder (2 business days before their appointment). Those called on an even-numbered weekday were allocated to the intervention arm (phone appointment reminder plus Lyft ride offer) and those called on an odd-numbered weekday were allocated to the control arm (phone appointment reminder only). We used this allocation scheme rather than individual-level randomization due to logistical limitations of our research staffing. These study-specific reminder calls from research staff were in addition to automated appointment reminder calls that were part of the usual reminder system for the study practices.

This study was approved by the institutional review board at the University of Pennsylvania. Informed oral consent was obtained to notify patients in the intervention arm of their rights and risks when using Lyft vehicles for transportation. There was no financial compensation.

Study Population and Phone Call Procedures

Patients eligible for study inclusion were (1) adults (age ≥18 years), (2) insured by Medicaid, (3) established primary care patients (ie, scheduled for a return visit instead of a new patient visit) at 1 of the 2 study practices, (4) resided within the high-poverty neighborhood of West Philadelphia, (5) scheduled to see a physician or nurse practitioner (eg, not a blood pressure check by a registered nurse or follow-up immunization injection), and (6) not already allocated to a study arm or offered the service previously during our pilot period described below. Eligibility was screened prior to calling a patient.

Patients allocated to the intervention or control arm received a phone appointment reminder from a research assistant 2 business days before the scheduled appointment. No voicemails were left for patients in either study arm. If patients returned a missed phone call in either arm, we answered calls during the hours of 9 AM to 6 PM. In these instances, patients received the study procedures based on their original allocation.

Also, as part of usual care, each patient received an automated phone call (ie, "robo call") 2 days before their appointment. These automatic calls occurred throughout the study in both arms. Therefore, patients in both arms received 2 types of phone call reminders for their upcoming appointments: 1 from an automated practice-based system and 1 from our research team, with a maximum of 3 attempts by our research assistants to make verbal contact.

Control Arm

Patients allocated to the control arm received the robo calls and phone call reminders from our study staff. During phone call reminders, the patients were blinded to the intervention.

Intervention Arm

When research assistants made verbal contact with patients, those allocated to the intervention arm were offered free transportation to and from their appointment using Lyft. The intervention was designed and tested at our primary care clin-

ics during an earlier pilot period. A description of the pilot test and quality assurance measures are provided in the eAppendix in Supplement 2. For intervention arm patients who answered the phone call, we assessed for logistical barriers to using Lyft services (lacking a text message–enabled phone, requiring a wheelchair-accessible vehicle, or not speaking English). Patients with 1 or more of these barriers were not offered a Lyft ride but were not excluded from the primary intent-to-treat analysis because those in the control arm were not screened for these barriers.

After confirming study eligibility, the research assistant asked patients whether they would be willing to spend additional time to learn about the study and using Lyft for transportation to and from their appointment. For consenting patients, a Lyft ride to their appointment was prescheduled using a web-based application designed by Lyft (the Dispatch tool). The Dispatch tool mirrors the mobile phone app available to Lyft users, permitting app-based ride requests and the ability to visualize rides while in transit to a specific destination for pickup and drop offs. Using the Dispatch tool, the requests were initiated and driver routes visualized by a research assistant, but not by the patient.

The Dispatch tool circumvents the need for patients to have a smartphone or app. When a Lyft ride was triggered using the Dispatch tool, the patient received a sequential series of text messages stating that (1) the ride had been scheduled by our team, (2) a driver was assigned to pick the patient up (received approximately 10 minutes before the driver's arrival), and (3) the driver had arrived at the preassigned pickup destination. Like the consumer experience of using Lyft through the smartphone app, patients received a text message containing the name, telephone number, vehicle make and model, and vehicle license plate number when a driver was assigned to pick them up. Unlike typical use, pick-up and drop-off locations were limited to the patient's home and the internal medicine practices.

For the return trip home, patients were provided a telephone number to call after their appointment was completed. A research assistant received their request and initiated a ride home using the Dispatch tool. Patients received the same 3 text message series for the return ride. Patients were provided the option to receive round-trip (to and from their appointment) or 1-way (to or from their appointment) transportation service.

Incentives and Payment

No incentives other than free Lyft rides made available to patients in the intervention arm were provided for participating in the study. Neither patients nor the research team tipped drivers. The ride service was offered to patients free of charge, mirroring the out-of-pocket costs these practices' patients experience using the NEMT program from Medicaid.

Measures and Data Collection

The prespecified primary outcome (missed appointment rate) was calculated for the intervention and control arms. Missed appointment rates were calculated as the number of no-shows and same-day cancellations divided by the total number of patients in the study arm based on data within the electronic medical record. Secondary prespecified outcomes were rates of emergency department visits within 7 days and 30 days after the primary care appointment. Emergency department utilization data were limited to health services provided by Penn Medicine facilities. As 1 measure of program costs, we collected financial data from the Dispatch tool.

Baseline measures for all patients were extracted from the medical record, which included demographic information (sex, age, race, and ethnicity), Medicaid insurance company, Charlson comorbidity index score, the type of health care professional (attending physician, resident physician, or advanced practice nurse) they were scheduled to see, and the type of visit (eg, return visit vs posthospitalization follow-up). The driving distance between their residential address listed in the medical record and the clinical practices was calculated using ArcGIS, version 10.3 (Esri).

Statistical Analysis

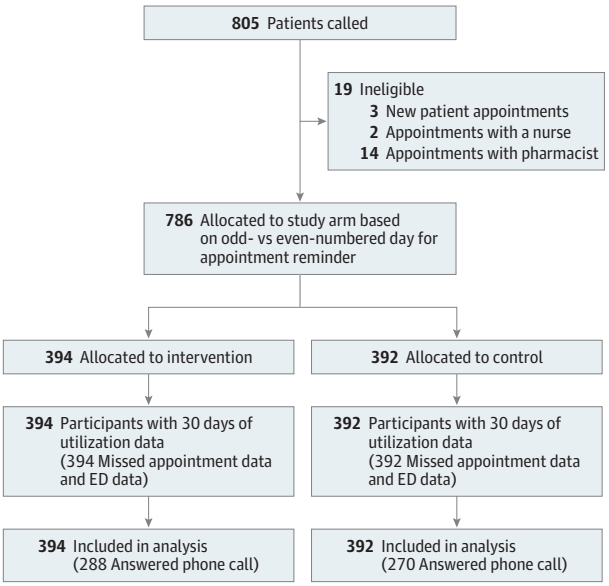
Comparisons of baseline demographics and comorbidity data between intervention and control arm patients were conducted using χ^2 or Wilcoxon rank-sum tests. Unadjusted comparisons for our primary and secondary outcomes were conducted using χ^2 analysis. Logistic regression models were used to adjust for specific covariates with imbalances between treatment arms.

The study, with at least 390 patients per arm, was designed to have 80% power to detect a 10% absolute difference in missed appointment rates between arms at a 2-sided α level of .05. This calculation was based on an estimated missed appointment rate of 49% based on the rate for the same internal medicine practices in the prior calendar year using the same eligibility criteria. Given that, to our knowledge, there were no previous trials of rideshare services, we judged that a 10% absolute reduction would be a meaningful difference for health system and insurance leadership.

Primary analyses used an intention-to-treat approach. The analytic sample was defined as all patients receiving a phone call initiated by 1 of our research assistants in either arm of the study. Patients were not excluded from the primary analysis if they did not answer the phone and, for those in the intervention arm, declined the ride or were screened from being offered a Lyft ride. The transportation cost per person in the intervention arm who consented to receive a Lyft ride was calculated, including the costs of rides taken and standard charges ($5-$10) from Lyft for missing a scheduled ride. We did not account for the cost of research staff time, which consisted of medical students participating in a research experience, nor did we capture the facility space costs (ie, the rooms and computers they called from) that are shared across multiple research projects.

Exploratory analyses included analyzing the as-treated group to investigate the potential result of not answering our phone call reminder. Additional exploratory analyses were performed assessing an association between the intervention and types of missed appointments (eg, no-shows and same-day cancellations) and by subgroups of demographics. Driving

Figure. Study Flow Diagram



ED indicates emergency department.

distance from the clinic and Charlson comorbidity index scores were stratified above and below the median.

Our study used outcome measures that were available in the electronic medical record. Therefore, we had no missing data for our outcomes. All hypothesis testing was conducted using a 2-sided, type I error rate of 0.05. All analyses were carried out using Stata, version 14.0 (StataCorp LLP).

Results

Patient Characteristics

The study sample included 786 patients, with 394 patients in the intervention arm and 392 in the control arm (**Figure**). Patients were predominantly black, non-Hispanic women; mean (SD) age was 46.0 (12.5) years (**Table 1**). Study arms were balanced with respect to sex, age, race/ethnicity, driving distance, Charlson comorbidity index score, Medicaid insurer, and type of outpatient appointment. There were significant differences in the type of health care professional that patients were scheduled to see, with a higher proportion of attending physicians (28.8% vs 23.6%) and nurse practitioners or physician assistants (15.8% vs 10.4%) for the control arm compared with the intervention arm ($P < .01$). For the control arm, 270 (68.9%) individuals answered the phone calls compared with 288 (73.1%) in the intervention arm ($P = .19$). Within the intervention arm, 162 (56.3%) people were not interested in rideshare. Among the 288 patients who answered the phone, 104 (36.1%) were interested, 11 (3.8%) were not offered the Lyft ride because they needed a wheelchair-accessible ride or did not have a text-capable phone, 93 (32.3%) consented and had a ride to clinic scheduled, and 85 (26.0%) used the service (**Table 2**).

Table 1. Patient Characteristics

Characteristic	Control (n = 392)	Intervention (n = 394)	*P* Value
Female sex, No. (%)	294 (75.0)	272 (69.0)	.06
Age, mean (SD), y	46.3 (12.6)	45.7 (12.5)	.47
Race, No. (%)			
White	4 (1.0)	10 (2.5)	.27
Black	377 (96.2)	371 (94.2)	
Other or mixed	11 (2.8)	13 (3.3)	
Ethnicity, No. (%)			
Hispanic	1 (0.3)	2 (0.5)	>.99
Non-Hispanic	391 (99.7)	392 (99.5)	
Distance from clinic, mean (SD), m	2.4 (1.0)	2.4 (1.1)	.79
Charlson comorbidity index score, mean (SD)	1.8 (2.3)	1.8 (2.4)	.98
Medicaid insurance company, No. (%)			
Plan 1	187 (47.7)	165 (41.9)	.25
Plan 2	128 (32.7)	146 (37.1)	
Plan 3	77 (19.6)	83 (21.1)	
Clinician type, No. (%)			
Resident	217 (55.4)	260 (66.0)	<.01
Attending	113 (28.8)	93 (23.6)	
Nurse practitioner or physician assistant	62 (15.8)	41 (10.4)	
Appointment type, No. (%)			
Posthospital discharge	10 (2.6)	17 (4.3)	.22
Reassigned to a new clinician	39 (9.9)	48 (12.2)	
Return visit to same clinician	343 (87.5)	329 (83.5)	

Table 2. Intervention Patients Who Answered the Phone Call

Measure	Intervention Arm (n = 392)
Answered the phone, No. (%)	288 (73.1)
Intervention uptake, No. (%)[a]	
Not interested	162 (56.3)
Declared they were unlikely to attend appointment	11 (3.8)
Someone other than patient answered, never talked to patient	11 (3.8)
Interested	104 (36.1)
Screened from receiving[b]	11 (3.8)
Consented	93 (32.3)
Used the service for appointment	85 (29.5)

[a] Percentages are calculated as a proportion of patients who answered their phone.

[b] Patients not offered the ride because of either requiring a wheelchair-accessible vehicle or did not have phone texting available.

Main Outcomes

For our prespecified primary outcome of interest, the missed appointment rate in the intervention arm was 36.5% vs 36.7% ($P = .96$) in the control arm (**Table 3**). Adjusting for the imbalance in provider types did not affect our results (eTable 1 in Supplement 2). For our prespecified secondary outcomes of interest, there were no significant differences in 7-day or 30-day rates of emergency department visits in the unadjusted or adjusted analyses controlling for clinician types. The mean (SD) cost per patient who consented was $14.00 ($6.88); range, $0 to $40.17.

Table 3. Primary and Secondary Outcomes

Outcome	Intention-to-Treat Group (n = 786)[a]			As-Treated Group (n = 558)[b]		
	No. (%)			No. (%)		
	Control (n = 392)	Intervention (n = 394)	*P* Value	Control (n = 270)	Intervention (n = 288)	*P* Value
Missed appointments	144 (36.7)	144 (36.5)	.96	94 (34.8)	88 (30.6)	.28
Same-day cancellation[c]	47 (12.0)	42 (10.7)	.56	40 (14.8)	35 (12.2)	.36
No show[c]	97 (24.7)	102 (25.9)	.71	54 (20.0)	53 (18.4)	.63
ED visits (<7 d)	4 (1.0)	8 (2.0)	.25	4 (1.5)	5 (1.7)	.81
ED visits (<30 d)	15 (3.8)	26 (6.6)	.08	12 (4.4)	16 (5.6)	.55

Abbreviation: ED, emergency department.

[a] Any patient who research staff called to provide an appointment reminder, regardless of whether they answered the phone.

[b] Patients who research staff called and the patient answered the phone call.

[c] Exploratory subgroup analysis.

Exploratory As-Treated and Subgroup Analyses

Among individuals who answered the phone, the missed appointment rate was 30.6% (88 of 288) in the intervention arm and 34.8% (94 of 270) in the control arm ($P = .28$). Evaluations of emergency department utilization in the unadjusted analyses or adjusted models remained statistically nonsignificant. Analyses assessing the association between the intervention and same-day cancellations and no-shows separately did not yield any significant findings in the intention-to-treat cohort or the as-treated group. There were no statistically significant intervention results in any patient subgroups (eTable 2 in Supplement 2).

Discussion

This study examined rideshare-based medical transportation for Medicaid patients at 2 urban, academic, general internal medicine practices. Few patients used rideshare-based medical transportation services for travel to and from their primary care appointment. We observed no significant difference in missed appointment rates for patients offered a Lyft ride compared with those in the control arm.

At the time we designed the study, there were several reasons to hypothesize that the intervention might succeed. Transportation is a notable barrier for Medicaid patients, despite having access to NEMT-based services.[2,3] Medicaid patients have significantly high rates of missed appointments compared with other populations and our population mirrored missed appointment rates reported in other studies.[2,10] Rideshare-based transportation was being explored as a viable alternative to NEMT[13,15]; however, we found no significant improvement in missed appointments.

Limitations

One possibility for the lack of improvement is that transportation-based strategies to reduce missed appointments do not work in our setting. Transportation may not have as much of an impact in our geographic region because the furthest point in West Philadelphia is less than 5 miles from the clinics and the public transportation network of buses and trolleys is extensive in our area. However, prior studies conducted in urban environments indicate that, even with short geographic distance and public transportation access, transportation remains a barrier.[2]

Second, transportation may be 1 of many factors influencing reasons why patients choose to miss or attend their primary care appointment. Other social risk factors, such as the stability of their home environment, may limit a patient's ability to attend appointments.

Third, our recruitment strategy may have affected the number of patients who used the service. Phone calls may not be the best way to contact patients to offer a new service. In-person communication, text messages, or emails may be more effective in recruiting patients. However, our study recruitment strategy balanced several competing issues, including limitations in our research staffing model and a desire by the health system to limit call-backs related to offering the service, which could, should it be fully implemented, impede practice workflow.

Fourth, we did not measure comfort with using text message communication. If patients were uncomfortable with text communication, which was required to dispatch ridesharing services, it could have resulted in low overall uptake of the service. However, this is unlikely to lead to differences between study arms based on our allocation scheme. Future studies should measure comfort levels with cellphone or smartphone technology as this may be an important mediator between the effect of rideshare-based interventions and outcomes, such as missed appointments.

Fifth, there was a secular change within the health system, or at least within these 2 clinics, resulting in fewer overall missed appointments. The change from 49% in the calendar year leading up to the start of our study to 36% is substantial. Clinic leadership reported that there were no changes in appointment reminder practices. This reduction suggests that something more powerful than our intervention may have occurred. Similarly, the missed appointment rate among control patients who answered our phone call was lower than those who did not answer: 34.8% vs 41.0%, respectively. Although these are not significant differences, we were not powered to detect a difference. A larger follow-up study is needed.

Sixth, our study population may not have been interested in ridesharing. Less than half of the patients stated that they were interested and less than half of those used ride-

share to or from the clinic. Further qualitative work is needed to understand interests in transportation alternatives, such as rideshare, in making health care more accessible for low-income patients in urban settings. Similarly, targeting patients with specific transportation needs or preferences (eg, individuals who have clearly defined transportation barriers or patients more likely to be interested in ridesharing) may result in higher uptake and may be associated with missed appointment rates. Targeting specific patient populations, however, may increase the operational costs due to resources needed to identify and coordinate services for those patients.

Each of these considerations represents a possible study or intervention limitation, affecting the interpretation of our findings. However, this study has several strengths. First, this was a large investigation of ridesharing that was simple and designed to be easily scaled or modified in areas where rideshare services are accessible. Second, our study was naturalized and pragmatic, with a control group unaware of the intervention and operationally meaningful outcomes measured through existing data sources. Third, although social determinants of health are widely recognized as a major contributor to premature deaths in the United States,[16] there is little evidence for effective or ineffective strategies that may guide health systems toward addressing these determinants.[17-19] In our study, we aimed to evaluate 1 intervention designed to address the barrier of transportation for 1 population. Similar studies of interventions for improving transportation as a means to better health care access are warranted and worth testing in other settings.

Conclusions

This study was undertaken to investigate rideshare medical transportation as a viable option for reducing missed appointments that could be easily integrated into the menu of transportation options available to low-income patients with Medicaid. A negative finding is important because it highlights that simply offering rideshare services to patients, which has been discussed within the health care industry, does not improve the attendance rate. It is possible that modifications to our model of providing rideshare-based transportation services or how we informed patients about the service might produce different results. Moreover, most studies of social interventions designed to improve health outcomes are often uncontrolled pre-post designs or cross-sectional studies, resulting in poor-quality evidence because of limitations inherent to these approaches.[20] Despite this trial's lack of success, controlled clinical trials examining the effect of interventions designed to address transportation needs and, more broadly, studying interventions that address the social determinants of health with the goal of improving health outcomes are needed and will have significant implications for future population health efforts.

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Author Contributions: Dr Chaiyachati had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.
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Additional Information: The data sets generated and/or analyzed during the present study are not publicly available because patients did not consent to have their information shared, but a limited data set without any patient-identifiable features (eg, excluding residential addresses) is available from the corresponding author on reasonable request.

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