

Predictive Modeling for Appointment No-show in Community Health Centers

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Abstract

Reducing no-show rates is one of the most important measures of access to care in Community Health Centers (CHCs). We used EMR and scheduling data to develop no-show prediction models to help design effective scheduling processes and system redesign for greater access in CHCs. Patient and provider characteristics and visit features are key elements for predicting patient adherence with an appointment.

Motivation

One key measure for improving access to care is reducing the number of “no-shows.” An appointment is considered a no-show when the patient misses the appointment without cancelling. No-show rates from 10% to 50% have been reported in different healthcare settings.

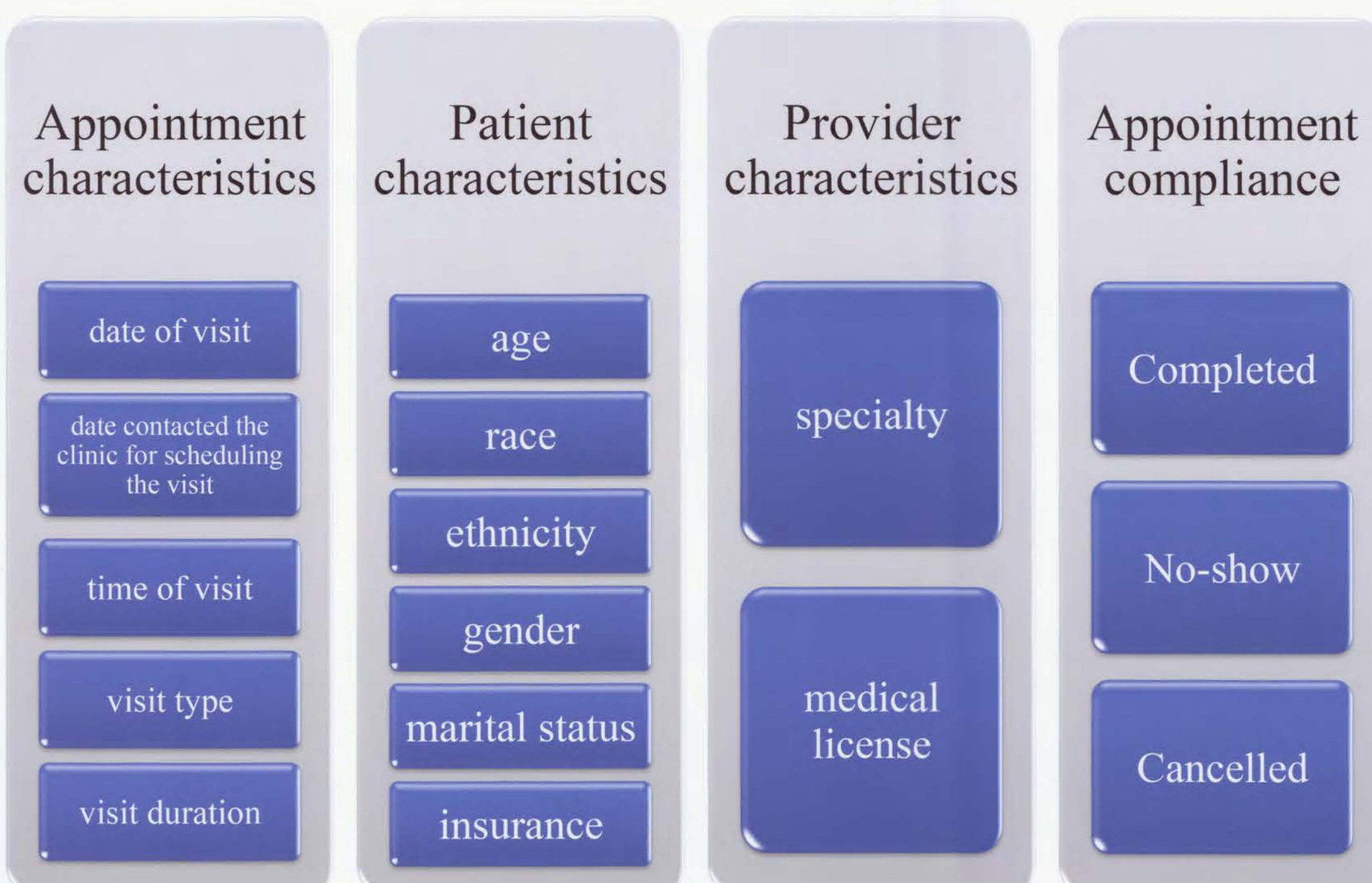
Purpose

In our current multiyear and multisite project, we are using simulation modeling to test and find the optimal scheduling processes, staffing and policies for improving access to care. Thus, we estimate patients’ no-show probabilities using statistical methods such as logistic regression. Here, we present a no-show prediction model and report predictors of no-shows by analyzing Electronic Medical Record (EMR) and scheduling data.

Methods

We evaluated different factors which we hypothesized may be related to appointment no-show.

- Collected all appointments and patient encounters during 2014 from an urban Community Health Center (CHC) in Indiana.
- Data fields:

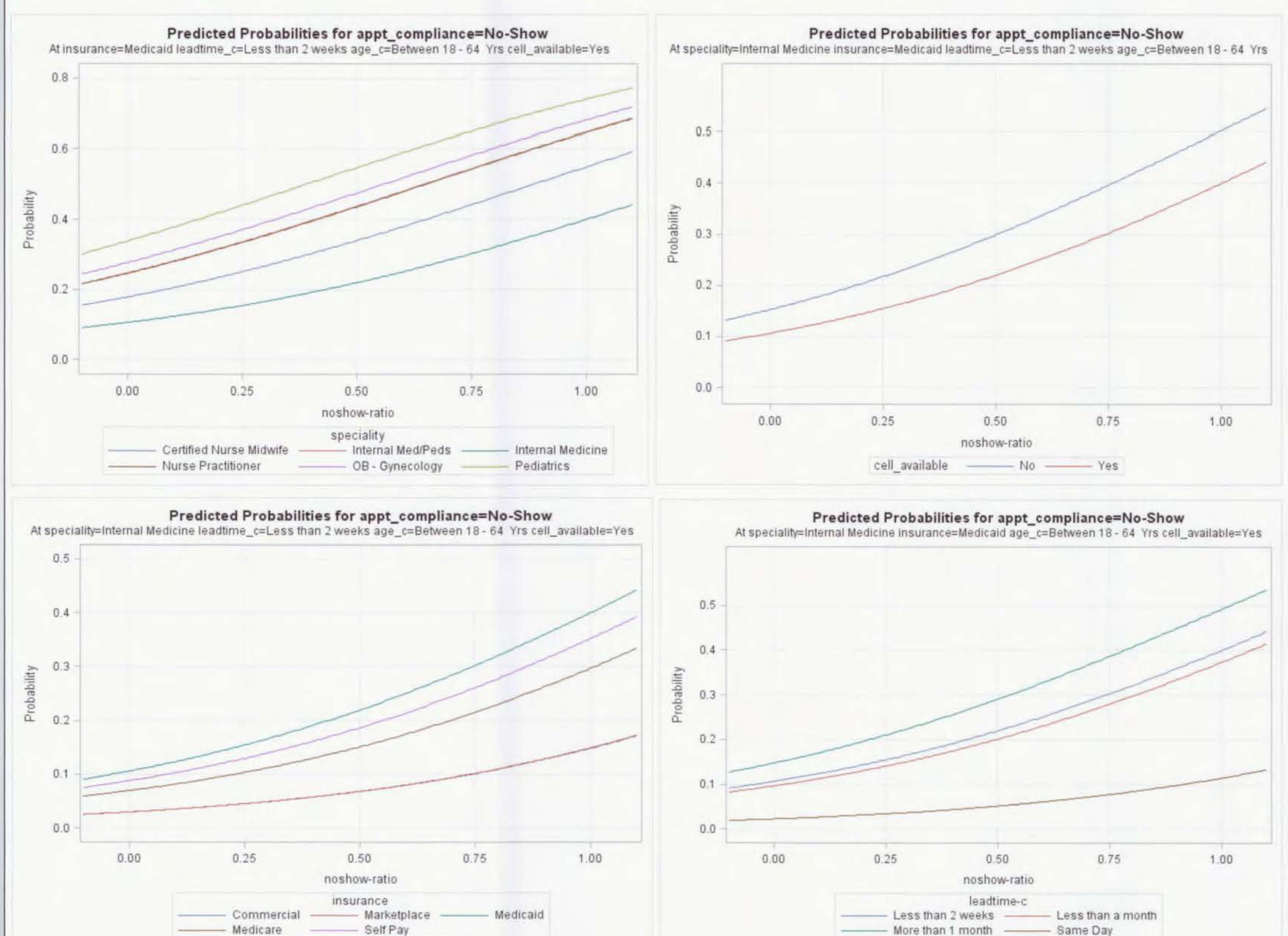
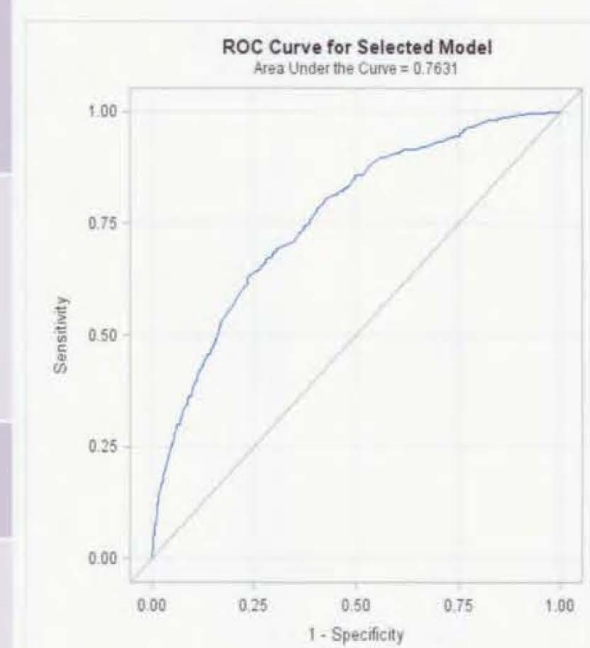


- The dataset included 15869 appointments for 3895 unique patients in 2014.
- New variables
 - “lead-time” = calculating the difference between date of visit and date the patient had contacted the clinic to arrange an appointment
 - “prior no-show rate” = the number of no-shows for a given patient prior to the last appointment, divided by the patient’s total number of appointments prior to the last appointment
- Appointment adherence (“no-show” or “arrived”), a binary variable, was the outcome variable in this project.
- Developed the no-show prediction model using logistic regression analysis in SAS

Results

The multivariate logistic regression model considered all variables in the dataset plus lead-time and patient prior no-show rate. Predictors of no-show in our final model included provider specialty, insurance type, age, cellphone availability, lead-time, and patient prior no-show rate.

Variables		p-Value	OR [95% CI]
Age	Continuous	<.0001	2.4 [1.1,3.4]
Lead-time	< 2weeks	<.0001	5.1 [3.3,8]
	>2 weeks, <1 month		4.6 [2.8,7.5]
	> 1 month		7.5 [4.7,12]
Provider Specialty	Pediatrics	<.0001	4.3 [1.6,6.6]
	OB-GYN		3.2 [2.2,8.6]
	Nurse Practitioner		2.7 [1.7,4.4]
	Certified Nurse Midwife		1.8 [1.1,2.9]
Insurance type	Private	<.0001	0.3 [0.2,0.4]
	Medicare		0.6 [0.3,1.2]
	Marketplace		0.3 [0.1,0.9]
	Self-Pay		0.8 [0.6, 1.1]
Cellphone availability	No	0.005	1.5 [1.2,1.9]
Prior no-show rate	Continuous	<.0001	5.6 [3.2,6.8]



Discussions

There are three key findings:

- First, more same-day appointments (greater open access scheduling) can reduce clinics’ no-show rates. It has been suggested that patients might miss their appointments made far in advance because of forgetting the appointment, getting better, or having other priorities.
- Second, patients who have frequently not shown for appointments in the past are more likely to no-show again. This group might be limited to same-day appointments.
- Third, higher no-show rates among patients without a cellphone may be a result of reduced appointment reminders. Alternative means for scheduling and appointment reminders may reduce no-show rates and improve access to care.

Acknowledgement

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References

1. Turkcan A, Nuti L, DeLaurentis PC, Tian Z, Daggy J, Zhang L, Lawley M, Sands L. No-show modeling for adult ambulatory clinics. In Handbook of Healthcare Operations Management 2013 (pp. 251-288). Springer New York.
2. Turkcan A, Toscos T, Doebbeling BN. Patient-Centered Appointment Scheduling Using Agent-Based Simulation. In: AMIA 2014 – Proceedings of the Annual Symposium of the AMIA. Washington, D.C., 2014; (pp. 1125-1133).
3. Mohammadi I, Turkcan A, Toscos T, Miller A, Kunjan K, Doebbeling BN. Assessing and Simulating Scheduling Processes in Community Health Centers. In: AMIA 2015 – Proceedings of the Annual Symposium of the AMIA. San Francisco, CA; (pp. 1598).