

The Effectiveness of Outpatient Appointment Reminder Systems in Reducing No-Show Rates

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ABSTRACT

BACKGROUND: Patients who do not keep physician appointments (no-shows) represent a significant loss to healthcare providers. For patients, the cost includes their dissatisfaction and reduced quality of care. An automated telephone appointment reminder system may decrease the no-show rate. Understanding characteristics of patients who miss their appointments will aid in the formulation of interventions to reduce no-show rates.

METHODS: In an academic outpatient practice, we studied patient acceptance and no-show rates among patients receiving a clinic staff reminder (STAFF), an automated appointment reminder (AUTO), and no reminder (NONE). Patients scheduled for appointments in the spring of 2007 were assigned randomly to 1 of 3 groups: STAFF (n = 3266), AUTO (n = 3219), or NONE (n = 3350). Patients in the STAFF group were called 3 days in advance by front desk personnel. Patients in the AUTO group were reminded of their appointments 3 days in advance by an automated, standardized message. To evaluate patient satisfaction with the STAFF and AUTO, we surveyed patients who arrived at the clinic (n = 10,546).

RESULTS: The no-show rates for patients in the STAFF, AUTO, and NONE groups were 13.6%, 17.3%, and 23.1%, respectively (pairwise, $P < .01$ by analysis of variance for all comparisons). Cancellation rates in the AUTO and STAFF groups were significantly higher than in the NONE group ($P < .004$). Appointment reminder group, age, visit type, wait time, division specialty, and insurance type were significant predictors of no-show rates. Patients found appointment reminders helpful, but they could not accurately remember whether they received a clinic staff reminder or an automated appointment reminder.

CONCLUSIONS: A clinic staff reminder was significantly more effective in lowering the no-show rate compared with an automated appointment reminder system.

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Not keeping physician appointments by patients (no-show) is a common occurrence that results in a significant loss to healthcare providers.¹ For physicians, a no-show results in lost time, decreased efficiency, and higher use of resources.² For patients, the cost includes their dissatisfaction in not

receiving earlier appointments and reduced quality of care, and can affect the health of other patients who may need appointments.³ To decrease the no-show rate, outpatient practices use various methods (eg, mailed reminders, telephone reminders).^{4,5} However, these schemes are expensive (salary support for nursing staff, secretaries, or front desk visit schedulers) and might not be effective.⁶

Automated telephone appointment reminder systems are now used to decrease the no-show rate. These systems allow for a reduction in staff requirements and provide a standardized, uniform reminder to the patient. Previous studies that investigated the use of automated reminders were performed in small select populations^{7,8} and did not compare

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automated systems with telephone calls performed by clinic staff. In addition, patient perception of an automated reminder versus a clinic staff reminder has not been reported.

We report the results of a prospective, randomized, parallel design study to compare the no-show rates of an automated appointment reminder system, clinic staff reminder, or no system at all. Patient perception of the type of reminder system was surveyed, and factors predicting the no-show were investigated.

MATERIALS AND METHODS

Study Population

We performed a prospective, randomized, parallel design clinical trial in the Department of Medicine at the Robert Wood Johnson University Medical Group, an outpatient multispecialty practice of the University of Medicine and Dentistry of New Jersey—Robert Wood Johnson Medical School. Study enrollees were patients in 1 or more of 10 specialty outpatient practices: heart transplantation, rheumatology, pulmonary, nephrology, hematology, general internal medicine, gastroenterology, endocrinology, cardiology, and allergy/infectious disease.

Study Design

From March to July 2007, patients scheduled for appointments were randomly assigned to 1 of 3 appointment reminder groups: telephone reminder by clinic staff members who normally perform the task (STAFF), automated appointment reminder (AUTO), and no reminder (NONE).

Information about each scheduled patient, visit type, physician, insurance type, and appointment status was extracted from the health information system (IDX/GE Healthcare) 7 days before the patient's appointment. Seven days were necessary to extract the data, assign randomization, upload patient lists to the automated system, and provide a call list to the clinical staff. Patients were then randomized by a computer-generated allocation sequence into 1 of the 3 groups: STAFF, AUTO, or NONE. The allocation sequence was concealed from the investigators and clinic staff. Clinic staff were not blinded to the patients they were instructed to call; however, they were unaware to which group (ie, AUTO or NONE) the remaining scheduled patients were assigned.

A list of names and phone numbers were provided to the clinic staff to provide patients with a telephone reminder. The clinic staff attempted to call the patient number once during business hours 3 days before the scheduled appointment. If a patient was contacted by telephone, the patient's appointment was confirmed or rescheduled at the

patient's request. If no contact was made, a message was left on the patient's answering machine or voice mail if available.

HouseCalls (TeleVox Software Inc., Mobile, Ala) was used as the automated appointment reminder system.⁹ The automated appointment reminder system attempted to reach the patient each night for 3 nights before the appointment. As determined by each specialty, a practice-customized computerized or live voice recording was played after a phone call was answered. The recipient of the call had the option of confirming the appointment or canceling the appointment. After 3 attempts if an appointment was not confirmed, the patient remained registered for the appointment.

CLINICAL SIGNIFICANCE

- Outpatient automated reminder systems are less effective in reducing no-show rates compared with receiving a reminder from live clinic staff.
- The type of reminder, age, visit type, wait time, division specialty, and type of insurance are significant predictors of no-shows to appointments.

Survey

On arrival to the appointment, every patient was administered a 4-question survey:

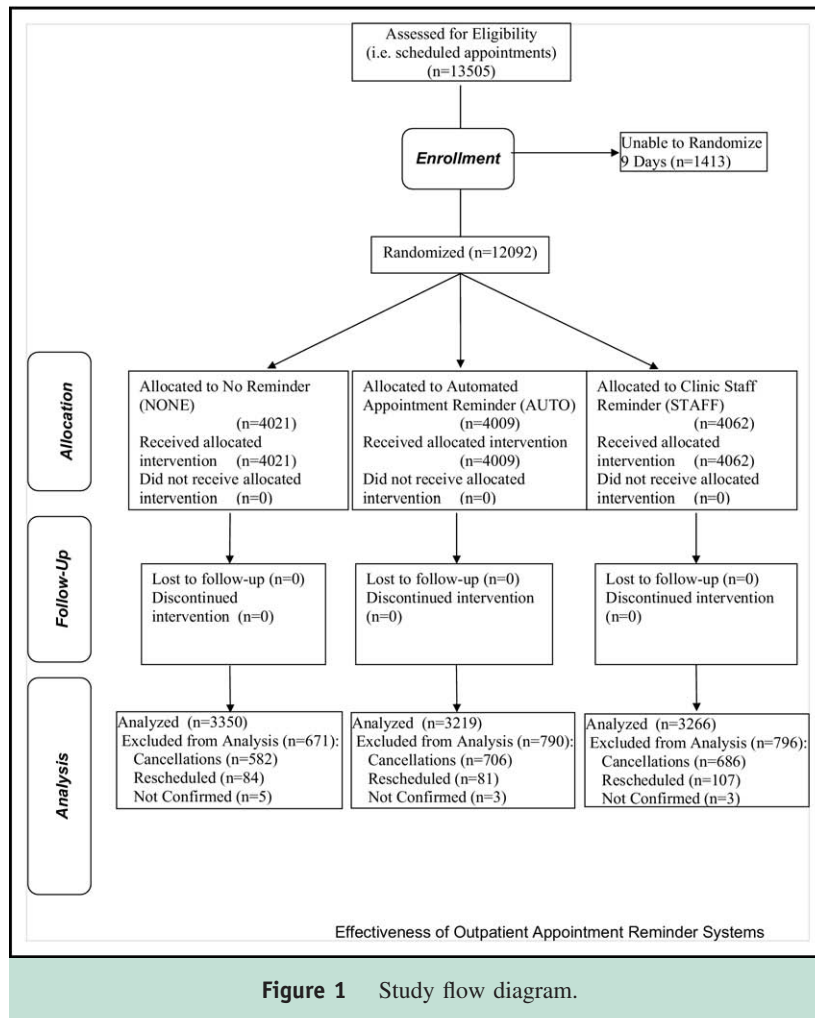
1. How long have you been a patient of the physician you are seeing today?
2. What type of reminder did you receive before today's appointment?
3. Was the reminder helpful for you to attend today's appointment?
4. How far did you travel to your appointment today?

Statistical Analysis

The primary end point of the study was the no-show rate. The no-show rate was calculated by dividing the number of missed appointments (no-shows) by the number of expected visits (no-shows + arrived). Analysis of the no-shows was performed by intention to treat. Differences in no-show rates between groups were compared by chi-square test and reported as odds ratios with 95% confidence intervals, using the NONE group as a reference.

The no-show rate of Robert Wood Johnson University Medical Group overall during the prior 2 quarters of the study was 12%. A sample size (per group) of 1059 was calculated to be sufficient to detect a change from 8% to 5% (638 for 9% to 5%) with a power of 80% (beta). The total number of visits per month was approximately 4000. Therefore, data collection over a period of 3 months was determined to be sufficient to detect a difference in the rate change. Statistical significance was determined to be $P < .05$.

Subgroup analyses were performed on the basis of age, type of visit (initial patient visit versus established patient visit), wait time between scheduling and appointment, practice specialty, and insurance type. This allowed hypothesis generation of why specific groups were less likely to show. Statistical analysis was performed using SAS version 9.1



(SAS Institute Inc, Cary, NC). The institutional review board at University of Medicine and Dentistry of New Jersey—New Brunswick/Piscataway approved the protocol.

RESULTS

Study Population

From March to July 2007, 13,505 patients were scheduled for appointments (Figure 1). For technical reasons, data for 9 days were removed from the final analysis because they were not uploaded to the automated appointment reminder system. This resulted in 1413 patients not randomized. The remaining 12,092 patients were randomized to the following groups: Clinic Staff Reminder STAFF (n = 3266), Automated Appointment Reminder AUTO (n = 3219), or NONE (n = 3350). The appointments of 2257 patients were cancelled, rescheduled, or not confirmed.

Baseline characteristics of the 4 groups were similar (Table 1). Of the 9835 analyzed patients (3 randomized groups), 8108 arrived. The no-show rates for patients in the STAFF, AUTO, and NONE groups were 13.6%, 17.3%, and 23.1%, respectively (pairwise, $P < .01$ by analysis of variance) (Figure 2). Cancellation rates were

not statistically different between the AUTO (17.6%) and STAFF (16.9%) groups. Cancellation rates were higher in the AUTO and STAFF groups when compared with the NONE group (14.5%) ($P = .0001$ and $P = .003$, respectively). Reschedule rates were not statistically different between the NONE group (2.09%) and the STAFF and AUTO groups (2.63% and 2.02%, respectively). Reschedule rates were not statistically different between the AUTO and STAFF groups ($P = .06$).

Bivariate Associations of No-Show Rate

Patients were distributed into quartiles by age: 18 to 44 years, 45 to 56 years, 57 to 68 years, and 69 to 100 years. The no-show rate for patients aged 18 to 44 years in the AUTO group tended to be lower than in the STAFF group ($P = .08$). The no-show rate decreased for every increase in age quartile (Table 2). By linear regression modeling, for every 1 year increase in age, the absolute no-show rate decreased by 2.4% ($P < .0001$).

Table 2 shows that the no-show rate of new patients overall was significantly higher than of established patients (17.7% vs 15.9%, $P < .04$). This remained true in the STAFF and AUTO groups (18.3% vs 12.5%, $P < .0001$;

Table 1 Demographics and Characteristics

N	None N = 3350	Auto N = 3219	Staff N = 3266	Total 9835
Gender				
Male	1429 (42.7%)	1422 (44.2%)	1426 (43.7%)	4277/9835
Female	1921 (57.3%)	1797 (55.8%)	1840 (56.3%)	5558/9835
Visit Type				
New patients	607 (18.1%)	585 (18.2%)	655 (20.1%)	1847/9835
Established patients	2497 (74.5%)	2409 (74.8%)	2376 (72.8%)	7282/9835
Unclassified				706/9835
Age (y)	55.9 ± 16.5	56.5 ± 16.4	55.8 ± 17.0	<i>P</i> = .22 (NS)
Insurance				
Commercial	1810 (54.0%)	1710 (53.1%)	1696 (51.9%)	5216/9835
HMO	190 (5.7%)	173 (5.4%)	170 (5.2%)	533/9835
Medicare/Medicaid	1216 (36.3%)	1206 (37.5%)	1249 (38.2%)	3671/9835
Self-pay	72 (2.2%)	55 (1.7%)	73 (2.2%)	200/9835
Other	61 (1.8%)	74 (2.3%)	76 (2.3%)	211/9835

NS = not significant; HMO = health maintenance organization.

20.2% vs 15.6%, *P* < .01, respectively). However, this difference was not observed among patients who received no call (23.6% vs 23.3%, *P* = not significant).

The overall median wait time (time from scheduling an appointment to the visit) was 33 days (interquartile range 0-376). For initial patient visits, the median wait time for patients who arrived to their appointments was 23 days (interquartile range 0-248). For these patients, the median wait times among the NONE, AUTO, and STAFF groups were 42.6, 45.1, and 41.2 days, respectively (*P* = not significant). The median wait time for initial patient visits who did not show was 40 days (interquartile range 0-254). For

these patients, the mean wait times among the NONE, AUTO, and STAFF groups were 55.0, 55.3, and 56.7 days, respectively (*P* = not significant). The no-show rates for initial patient visit wait times divided into quartiles (0-7, 8-27, 28-50, 51-254) were 9.3%, 14.0%, 20.9%, and 26.9%, respectively. These were statistically significant from one another pairwise for all groups (Figure 3). Linear regression showed that each increase of 30 days of wait time for initial patient visits resulted in a 25% increase in the no-show rate.

Among the specialty departments, the gastroenterology division had the highest overall no-show rate: 21%. The lowest no-show rate overall was seen in the STAFF group of the heart transplant division: 4.11%. However, there was no statistically significant difference in the no-show rates among the divisions for each of the call groups.

Insurance types were categorized as commercial, health maintenance organization, Medicare/Medicaid, self-pay, and other. The no-show rates by call group and insurance type are depicted in Table 2. In the NONE, AUTO, and STAFF groups, the self-pay patients had the highest no-show rate.

Survey Results

Of the 12,092 patients who arrived, 7223 completed the questionnaire. Table 3 displays the responses to the question “What type of reminder did you receive?” Correctly identified responses are highlighted in the table. In the STAFF group, 77% recalled being reminded compared with 73% in the AUTO group (*P* = .02). Among those who recalled receiving an automated reminder, 35% thought the call was from an individual. Notably, among the patients who did not receive a call, 27% answered that that they did receive a telephone call.

Table 3 also displays the responses to the question “Was the reminder helpful for you to attend today’s appointment?” Among the patients who recalled receiving a call, 78% of the STAFF group and 72% of the AUTO group

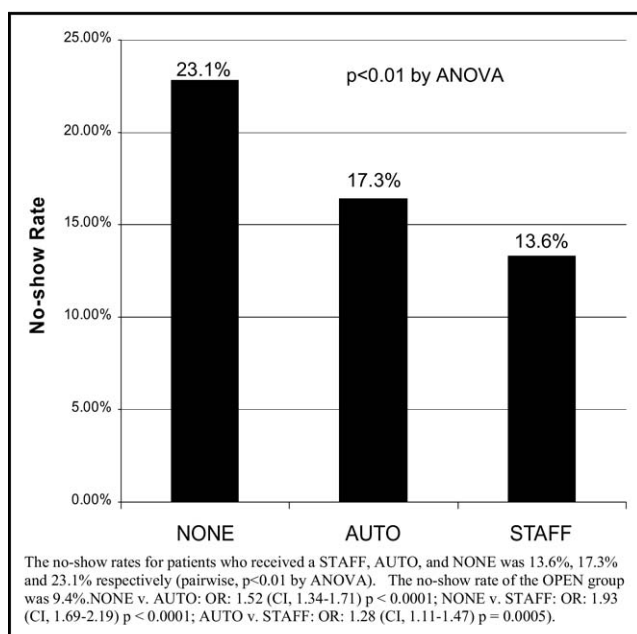


Figure 2 The no-show rates by call group.

Table 2 Bivariate Associations of No-Show Rate

	None		Auto		Staff	
Age, y						
18-44	255 (33%)	$P < .0001$	189 (36%)	$P < .0001$	161 (37%)	$P < .0001$
45-56	211 (28%)		145 (28%)		128 (19%)	
57-68	168 (22%)		110 (21%)		81 (19%)	
69-100	131 (17%)		83 (16%)		65 (15%)	
Visit type						
New patient	143 (24%)	$P = NS$	118 (20%)	$P < .01$	120 (18%)	$P < .0001$
Established patient	579 (23%)		373 (16%)		295 (12%)	
Insurance type						
Commercial	426 (24%)	$P < .0001$	267 (16%)	$P < .0001$	230 (14%)	$P < .0001$
HMO	44 (23%)		37 (21%)		17 (10%)	
Medicare/Medicaid	243 (20%)		179 (15%)		144 (12%)	
Self-Pay	28 (39%)		26 (47%)		26 (36%)	
Other	23 (38%)		18 (24%)		16 (21%)	

NS = not significant; HMO = health maintenance organization.

reported the reminder was helpful ($P < .0001$). Of the 78% of the STAFF group who found the reminder helpful, 85% correctly identified being called by clinic staff. Of the 72% of the AUTO group who found the reminder helpful, only 48% correctly identified being called by an automated reminder. The difference between the groups that correctly identified the reminder system was statistically significant ($P < .0001$). The reported duration of established doctor-patient relationships (survey question 1) or travel distance (survey question 4) were not associated with the no-show rate.

Multivariate Analysis

Multivariate analysis by logistic regression modeling adjusting for appointment reminder group, age, gender, visit

type, wait time (from scheduling to appointment), division, and insurance type showed that appointment reminder group, age, visit type, wait time, division specialty, and insurance type were significant predictors of the no-show rate (Table 4). The STAFF group had the lowest no-show rate ($P < .0001$). The older age groups had the lowest no-show rate ($P < .0001$). Commercial insurance carriers were most likely to show ($P < .0001$), whereas self-payers were least likely to show ($P < .0001$). The gastroenterology division was least likely to show ($P < .001$).

DISCUSSION

A 1992 meta-analysis of various studies showed that a reminder can be used to decrease the no-show rate.¹⁰ A case-control trial of 1296 appointments from a Swiss university outpatient clinic showed a no-show rate of 15.8%.¹¹ Our study's no-show rates were consistent with previous studies showing no-show rates ranging from 2% to 30%.¹¹⁻¹⁵ Our prospective, randomized study on 13,505 appointments demonstrated a lower no-show rate with a clinic staff reminder compared with an automated appointment reminder. No significant difference was noted in reschedule rates between the groups. However, higher cancellation rates were associated with the presence of a reminder system. Both the results and the patients surveyed indicate the need for and acceptance of an appointment reminder.

Our study showed that older age was associated with a lower no-show rate. This was similar to previous studies; however, this has not been shown consistently.^{11,13} Possible explanations of lower no-show rates include the following: older individuals have more conditions that necessitate attending an appointment, they are likely more cognizant of their own healthcare, and they have more time in their schedule. Established patients were more likely to show at an appointment compared with new patients in the AUTO and STAFF groups. Established patients likely feel a con-

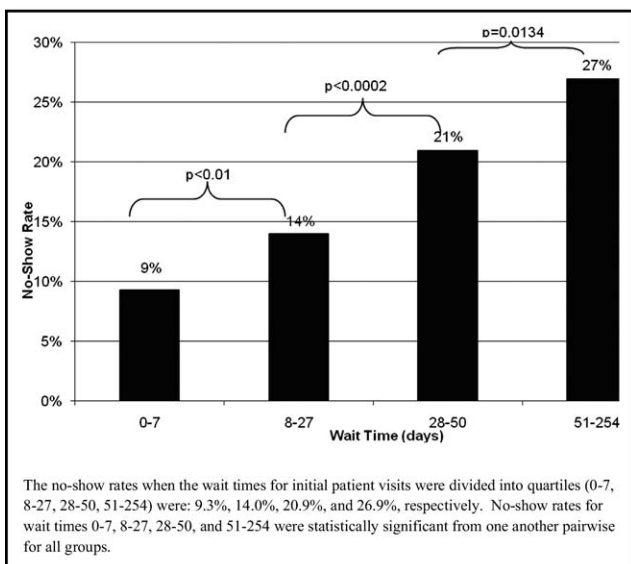


Figure 3 No-show rates for initial patient visit wait times.

Table 3 Survey Responses to Questions 2 and 3

Response	Group						Total
	None		Auto		Staff		
Question 2: What type of reminder did you receive?							
Staff member	523	23%	849	35%	1781	71%	3153
Computer system	90	4%	915	38%	142	6%	1147
None	1510	66%	503	21%	446	18%	2459
Left blank	175	8%	136	6%	153	6%	464
Total	2298		2403		2522		7223
Question 3: Was the reminder helpful for you to attend today's appointment?							
Left blank or N/A	1028	45%	321	13%	279	11%	1629
Helpful	710	31%	1730	72%	1970	78%	4411
Staff member	480	68%	785	45%	1669	85%	
Computer system	76	11%	828	48%	128	6%	
None	131	18%	94	5%	144	7%	
Left blank	23	3%	23	1%	29	1%	
Not helpful	560	24%	352	15%	273	11%	1185
Staff member	36	6%	56	16%	97	36%	
Computer system	13	2%	83	24%	12	4%	
None	505	90%	207	59%	155	57%	
Left blank	6	1%	6	2%	9	3%	
Total	2298		2403		2522		7223

N/A = not applicable.

nection with their provider and therefore are more likely to attend the appointment to maintain the relationship and continuity of care.

Studies have suggested that the delay between scheduling the appointment and the visit date can be a cause of missed appointments.^{16,17} Our data showed that the longer the wait time for initial patient visits, the more likely the patient is to not show at the appointment. Therefore, to attain new patients, practices must be able to grant appointments relatively quickly (ie, must provide better access time).

Among the insurance groups, the order of decreasing no-show rates was: NONE, AUTO, and STAFF. However, in the self-pay group, the no-show rate was the highest with the automated appointment reminder. In this group, the automated system seems to have had a negative effect compared with the baseline of no-call. The self-pay group is an independent predictor of the no-show. This may be tied to the financial consequences of a visit. If a patient thought an appointment was unnecessary (either the condition had resolved or the patient was able to self-manage the symptoms), he/she was less likely to show. In contrast, having commercial insurance and a health maintenance organization plan were independent predictors of attending an appointment.

Multivariate analysis also determined that the gastroenterology division was an independent predictor of not showing. Patients tend to miss appointments for symptoms that are self-resolving. In contrast, the clinic staff reminder system was most effective in the heart transplant division. Patients in this practice have an established schedule of follow-up after a lifesaving intervention. The lowest no-

show rate was only seen in the STAFF group, and this might reflect an established expectation in this division to be personally reminded.

In a study by Lacy et al,¹⁶ 3 areas were cited by patients as to why they do not show: "emotional barriers, perceived disrespect of the patient's beliefs and time by the health care system, and distrust and lack of understanding of the scheduling system." The higher arrival rate in the clinic staff reminder group compared with the automated appointment reminder group may be explained by perceived disrespect by the health care system. Some might associate a clinic staff reminder with respect for their own time and higher quality of care. However according to our survey results, patients found an appointment reminder helpful, but they could not accurately differentiate between a clinic staff reminder and an automated reminder.

STUDY LIMITATIONS

Limitations included the difference between the number of call attempts between the Clinic Staff Reminder (STAFF) and Automated Appointment Reminder (AUTO) groups, the difference in time of day when calls were made in the Clinic Staff Reminder and Automated Appointment Reminder groups, and only patients who arrived to their appointments were surveyed. Another limitation is that patients may have multiple appointments scheduled on the same day, which would decrease the likelihood of a no-show. This was not accounted for in the analysis. This study was conducted from March to July; therefore, the effect of seasonality could not be shown. The no-show rates may, in

Table 4 Multivariate Analysis by Logistic Regression

Variable	Odds Ratio (95% CI)	P Value
Appointment reminder		
Auto	1.50 (1.33-1.71)	.29
Staff (compared with None)	1.98 (1.74-2.26)	<.0001
Age (for every 10 y)	1.02 (1.02-1.03)	<.0001
Gender: female	1.00 (0.90-1.12)	.98
Visit type: initial patient visit	0.95 (0.83-1.09)	.04
Wait time (for every 30 d)	0.998 (0.998-0.999)	.002
Division		
Rheumatology	0.73 (0.47-1.13)	.06
Pulmonary	0.78 (0.50-1.22)	.35
Nephrology	0.87 (0.54-1.40)	.94
Hematology	0.93 (0.54-1.58)	.63
General internal medicine	0.80 (0.52-1.23)	.36
Gastroenterology	0.66 (0.43-1.01)	.0005
Endocrinology	0.95 (0.62-1.45)	.12
Cardiology	0.91 (0.60-1.39)	.39
Allergy/infectious disease (compared with heart transplantation)	0.99 (0.60-1.67)	.29
Insurance		
Commercial	1.61 (1.16-2.21)	<.0001
HMO	1.56 (1.06-2.29)	.0006
Medicare/Medicaid	1.24 (0.88-1.73)	.085
Self-pay (compared with Other)	0.51 (0.34-0.79)	<.0001

CI = confidence interval; HMO = health maintenance organization.

fact, be higher in the winter months. The process of scheduling an appointment and actually keeping it involves many factors that could result in a missed appointment. The no-show rate likely depends on a number of factors that may not have been evaluated in this article, including the local environment, the culture of an individual practice, or the presence of a disincentive for missing an appointment (eg, a no-show fee). However, this randomized trial was powered to exclude small clinical differences, and the observer-blind study design minimized bias.

CONCLUSIONS

The clinic staff reminder significantly reduced the no-show rate. Although the automated reminder system was significantly less effective, it likely has a cost advantage making it more attractive. Further economic evaluation is required to confirm that the reduction in no-shows compensates for the increased cost of using a clinic staff reminder. Future studies also might explore the use of other reminder systems: electronic mail, cell phone voice message reminders, or text messaging. This may improve the no-show rates of the younger

population. The use of open scheduling or on-demand appointments may further improve no-show rates.¹⁸⁻²⁰ However, as our study showed despite available technology, the personalized reminder yielded a lower no-show rate.

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