Text Message Reminders of Appointments: A Pilot Intervention at Four Community Mental Health Clinics in London

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Objective: Forgetting is commonly stated as a reason for missing mental health appointments. The authors examined the effect of short message service (SMS), or text message, reminders on the attendance of appointments at four community mental health clinics in London. **Methods:** Attendance of outpatient appointments roughly between March and June of 2008 (N=648), 2009 (N=1,081), and 2010 (N=1,088) was examined. Reminder messages were sent seven and five days before an appointment in 2009 and seven and three days before an appointment in 2010; patients in the 2008 sample received no reminder messages. Appointment attendance during the sample periods was compared by using multiple logistic regression analysis and adjusting for sociodemographic and clinical confounders. **Results:** Missed appointments accounted for 36% of appointments in 2008, 26% of appointments in 2009, and 27% of appointments in 2010. The relative risk reduction in failed attendance was 28% between the 2008 and 2009 samples and 25% between the 2008 and 2010 samples. Attendance rates were significantly higher for the 2009 and 2010 samples than for the 2008 sample (p<.001) but did not differ between the two intervention periods. **Conclusions:** SMS-based technology can offer a time-, labor-, and cost-efficient strategy for encouraging engagement with psychiatric outpatient services. In England alone, a reduction of 25% to 28% in missed outpatient clinic appointments would translate to national cost savings of more than £150 million, or $245 million, per year, and likely have clinical benefits as well. (*Psychiatric Services* 63:161–168, 2012; doi: 10.1176/appi.ps.201100211)

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Missed outpatient clinic appointments cost the National Health Service (NHS) in England more than £600 million ($980 million) a year for a population one-fifth the size of the United States (1–4). Mental health services are among the worst affected, given that 20% to 34% of scheduled appointments result in "did-not-attend" (DNA) outcomes (5,6). Missed psychiatric appointments delay access to vital care and increase the risk of continuing nonattendance, disengagement from services, rehospitalization, and medication nonadherence (6–10).

Because forgetting is a commonly stated reason for missing psychiatric appointments (6,9,11), attempts to encourage attendance have frequently relied on reminders. Simple postal or telephone-call prompts, usually delivered one to 14 days before the psychiatric appointment, have been reported to reduce rates of DNA by 26% to 76% (5,12–15), particularly when they are received close to the time of the appointment (16).

An alternative approach has relied on short message service (SMS) technology, or text messaging. SMS messages are more cost-effective, are swifter to deliver, and are likely to receive a faster response than letters, and they are less intrusive than phone calls. Substantial numbers of messages may be dispatched simultaneously, reducing labor expenditure. Text message interventions have been

successfully used in diverse medical settings to improve clinic attendance, health care–related communication, medication adherence, and clinical outcomes for an extensive range of medical conditions, including diabetes, tuberculosis, and HIV and other sexually transmitted infections (2,17–31).

No systematic investigation has explored the utility and suitability of SMS appointment reminders for mental health patients, with the exception of a small pioneering study by Pijnenborg and colleagues (32). Therefore, robust evaluations are needed before undertaking a wider rollout of SMS technology in mental health settings (1).

We report a pilot study of 2,817 outpatient appointments in four community mental health clinics located in an inner borough of London. The study is the largest investigation of psychiatric appointment reminders reported to date and the first large systematic exploration of SMS-based applications in mental health services. We compared the attendance outcomes of appointments sampled from the same three-and-a-half-month period during 2008 (N=648), 2009 (N=1,081), and 2010 (N=1,088). In 2008, patients received no reminders; in 2009, they received SMS reminders seven and five days before appointments; and in 2010, they received SMS reminders seven and three days before appointments. We hypothesized that rates of nonattendance would be significantly reduced during the 2009 and 2010 interventions compared with rates for 2008 and that the greatest reduction in missed appointments would occur in 2010.

Methods
Analytic sample
The analytic sample comprised 2,817 appointments for 1,256 outpatients in four clinics run by the Assessment and Shared Care (ASC) Community Mental Health Team of the Oxleas NHS Foundation Trust between March 17 and July 2 of 2008, March 16 and July 2 of 2009, and March 16 and July 2 of 2010. All appointments in the 2009 and 2010 samples were prompted by SMS reminders to out-

patients' mobile phones seven and five days and seven and three days, respectively, before each appointment. No reminders took place during the 2008 study period, which was used for comparison. (No reminders were issued between May 11, 2009, and May 28, 2009, because of a technical fault, and data for 2008, 2009, and 2010 during that period were omitted from the analyses.)

The ASC team is based at the Ferryview Health Center in Woolwich and provides outpatient mental health care for residents of Greenwich, an inner-London borough with a population of about 228,100. The four clinics include a postdischarge clinic for patients recently discharged from inpatient care, an assessment clinic for patients referred by a general practitioner or other health care professional, and two outpatient (morning and afternoon) clinics for patients who have an established relationship with the service and attend standard appointments within a treatment course. The four clinics are run by a variety of psychiatrists, from consultants to senior house officers.

Appointments were included in the sample if the electronic clinical records system of the Oxleas Trust, a Web-based application managed by British Telecom and called "RiO," contained a mobile phone number valid in the United Kingdom for the patient; if the appointment outcome was recorded as "attended" or DNA by administrative and reception staff under the direction of the patient's health care provider; if the patient had an *ICD-10* (33) diagnosis of a mood or affective disorder (F301, F309–F323, F328–F334, and F339–F341), of a neurotic, stress-related, or somatoform disorder (F400–F402, F409–F412, F418–F422, F429–F432, F444–F445, F448–F450, F452–F454, and F480), of schizophrenia or a schizotypal or delusional disorder (F200, F202–F206, F209, F21x, F220, F229–F233, F238–F239, F24x, F250–F252, F259, and F29x), of a disorder of adult personality or behavior (F600–F609, F61x, F620, F630, F633, F641, F648, and F688), or of a mental or behavioral disorder due to psychoactive substance use (F100–F103, F105, F107, F109, F112,

F119–F122, F125, F129–F130, F132, F139–F142, F144, F149–F151, F167, F171, F190–F192, F195, F197, and F199); and if the patient consented to receive SMS reminders.

SMS intervention
The study began in March 2009 as a nonrandomized pilot intervention by the ASC team at Ferryview to encourage appointment attendance among outpatients. The intervention gave rise to encouraging results and was repeated with a modified protocol from February 2010 onward.

For the 2009 pilot, all the electronic clinical records in RiO were downloaded daily to a structured query language database. Scripts were run to extract the participants' mobile phone numbers and time and date of appointments and to "cleanse" the data by removing spaces, dashes, letters, and numbers with fewer or more than 11 digits or those not starting with 07—all valid mobile phone numbers in the United Kingdom have 11 digits and start with 07. Next, e-mails with the "clean" details were generated to the internal e-mail server of the Trust and forwarded to a different server attached to an SMS gateway. The SMS gateway converted the e-mails into mobile-phone SMS messages, which were sent to the recipients via a global-system-for-mobile-communications modem.

The reminders were received at 6 p.m., seven and five days before each scheduled appointment, and contained the following standardized script: "You have an appointment on TESTDAY at TESTTIME at Ferryview. Please call TESTNUMBER if you cannot come." In line with NHS Trust confidentiality procedures, the patient and the Trust were not identified in the SMS. The cost of the reminders was the same as for standard SMS messages.

During the 2010 pilot an identical protocol was used except that the internal e-mail server of the NHS Trust generated encrypted emails to an NHS.net account set up for the intervention that used scripts that were configured with extra software to comply with NHS.net security requirements. (NHS.net mail is a national secure e-mail service en-

dorsed by the British Medical Association and the Royal College of Nursing.) The NHS.net service forwarded the e-mails to its own SMS gateway, which generated the SMS reminders. The reminders were delivered seven and three days before each appointment at no cost to the Oxleas Trust.

Quality data checks and patient consent

The Trust's clerical and administrative staff updated the outpatients' details in RiO regularly. To ensure that as many clients as possible would receive the SMS intervention, we (DH, HS, or HS) contacted outpatients individually to validate, add, or update their mobile phone number entries in RiO. If no valid mobile number was available, a home, work, or other alternative phone number that had been entered in Rio or obtained from the client's general practitioner was used to contact the patient in order to request a mobile phone number. Alternatively, reception staff were asked to record the patient's mobile phone number at the next outpatient appointment. All *ICD-10* diagnostic codes in RiO were confirmed by the patients' psychiatrists before the analysis.

Consultation with three research ethics committees—Bexley and Greenwich National Research Ethics Committee; Oxleas Research and Development Office, Joint South London and Maudsley; and Institute of Psychiatry Research Ethics Committee—confirmed that the SMS intervention met criteria for service development and improvement and did not require ethical approval. However, in line with the Trust's policies on confidentiality and information sharing, the Oxleas Informational Governance Manager advised that patients should give consent to participate in the intervention. For the 2009 pilot, consent was obtained when patients were contacted to validate, add, or update their mobile number entries and was recorded in RiO. For the 2010 pilot, all patients were sent an SMS message before the launch of the intervention that informed them about the service and instructed them to

contact ASC if they did not wish to receive SMS reminders.

Statistical analysis

The statistical analysis was conducted using SPSS, version 15 for Windows (34), and Stata, version 10.0 for Windows (35). To account for seasonal effects (36), our main statistical analysis was restricted to appointments scheduled for the same three-and-a-half-month period in 2008, 2009, and 2010 (N=2,817).

The subjects of the measurements were appointments rather than individual patients; therefore, the database contained as many copies of each patient's characteristics as the total number of appointments scheduled for that patient. To account for the nonindependence of measurements related to different appointments for the same patient—in other words, each patient was a cluster—our main statistical analysis was adjusted for clusters throughout. Cluster-adjusted regression analysis provides robust variance estimates accounting for within-cluster correlations and safeguards against potential violations of the standard regression assumptions (37).

Differences across the three study periods in service and patient characteristics, such as missed appointments, clinic, patient gender, age, ethnicity, occupation, marital status, diagnosis, number of appointments or of prior inpatient admissions, and length of last inpatient admission were examined by using univariable linear, logistic, or multinomial regression. To examine the effect of the SMS intervention on attendance outcome, we identified patient and service characteristics other than the SMS reminders that might influence attendance outcome to control for potential confounders in the main analysis. In this preliminary step, we carried out a series of exploratory logistic regression analyses, each examining the effect of a separate study variable on attendance outcome for all sampled appointments during 2008–2010, adjusting for the three levels of SMS intervention (none, seven- and five-day reminders, and seven- and three-day reminders. Variables that emerged as significant pre-

dictors of attendance in these exploratory analyses were entered as covariates in the final model—a multiple logistic regression analysis examining the effect of the SMS intervention on attendance outcome and controlling for potential confounders.

Using segmented regression analysis adjusting for autocorrelation and seasonality, we also conducted interrupted–time-series analysis on all appointments scheduled for the continuous period March 2008–July 2010 regardless of diagnosis, mobile phone ownership, and appointment outcome (N=24,709) to examine whether changes in intervention status (off-on-off, etc.) were associated with the rate of appointments missed or attended. This approach aimed to address potential problems associated with unknown changes in clinic practices, such as how administrative staff classified appointment outcome, and to identify trends in missed or attended appointments over time. The proportion of appointments missed or attended every 15 days was used as the outcome.

Results

Of all ASC appointments (N=24,709) scheduled between March 2008 and July 2010, 70% (N=17,391) were classified as attended or DNA; 14% (N=3,526) were cancelled by the clinic or clinician, 12% (N=2,900) were cancelled by the patient, and 4% (N=892) were entered in error. Seventy percent of appointments (N=17,383) were for patients who had a mobile phone number valid in the United Kingdom, and 74% (N=18,329) were for patients who had been diagnosed as having an *ICD-10* diagnosis that met criteria for inclusion in the sample. Only 19 (.1%) patients opted not to receive SMS. Of the appointments included in the main statistical analysis (N=2,817), 882 were for patients with a mood or affective disorder; 666 were for patients with a neurotic, stress-related, or somatoform disorder; 458 were for patients with schizophrenia or a schizotypal or delusional disorder; 452 were for patients with a disorder of adult personality or behavior; and 359 were for patients with mental or behavioral disorders due to psychoactive substance use.

Table 1 presents the number of appointments scheduled or missed during the three study periods by characteristic of the patients or by ASC clinic. Table 2 lists patient characteristics during the three study periods.

The percentage of appointments that resulted in DNA outcomes was lower during the first (26%) and second (27%) SMS interventions than during the baseline period (36%) (Table 1). The absolute- and relative-risk reductions between baseline and the first intervention and between baseline and the second intervention were 10% and 28%, and 9% and 25%, respectively. Before covarying for potential confounders was undertaken, the three study periods differed significantly in attendance outcome (p<.001), patient diagnostic characteristics (p=.005), and clinic holding the appointments (p<.001) (Table 1); they also differed in patient age (p<.001) (Table 2).

With the exception of gender and length of last inpatient admission, all study variables emerged as significant predictors of appointment attendance. They included the clinic where the appointment was made (χ^2=15.69, df=3, p=.001), patient diagnosis (χ^2=58.24, df=4, p<.001), number of appointments per patient (odds ratio [OR]=1.02, 95% confidence interval [CI]=1.00–1.03, p=.03), number of prior inpatient admissions (OR=.88, CI=.82–.94, p<.001), age (OR=1.03, CI=1.02–1.04, p<.001), race-ethnicity (χ^2=8.20, df=3, p=.04), occupation (χ^2=11.75, df=4, p=.02), and marital status (χ^2=12.05, df=3, p=.007).

The results of the final multiple regression model are presented in

Table 1

Appointments at four mental health clinics, by study period[a]

Variable	2008				2009				2010				Wald χ^{2d}	df	p
	Scheduled		Missed		Scheduled		Missed		Scheduled		Missed				
	N	%[b]	N	%[c]	N	%[b]	N	%[c]	N	%[b]	N	%[c]			
All	648	100	232	36	1,081	100	280	26	1,088	100	292	27	20.26	2	<.001
Mental or behavioral disorder													21.93	8	.005
Substance use	62	10	27	44	150	14	64	43	147	14	68	46			
Adult personality or behavior	77	12	33	43	174	16	53	30	201	19	64	32			
Neurotic, stress-related, or somatoform	176	27	65	37	260	24	67	26	230	21	60	26			
Schizophrenia or schizotypal or delusional	115	18	42	37	166	15	35	21	177	16	44	25			
Mood or affective	218	34	65	30	331	31	61	18	333	31	56	17			
Clinic													23.91	6	.005
Postdischarge	32	5	13	41	34	3	15	44	15	1	6	40			
Assessment	25	4	12	48	29	3	8	28	24	2	5	21			
Outpatient, morning	214	33	84	39	417	39	120	29	390	36	120	31			
Outpatient, afternoon	377	58	123	33	601	56	137	23	659	61	161	24			
Gender													1.81	2	.40
Male	280	43	105	38	499	46	139	28	480	44	133	28			
Female	368	57	127	35	582	54	141	24	608	56	159	26			
Race-ethnicity													7.71	6	.26
White	476	74	175	37	751	70	192	26	752	69	212	28			
Asian	33	5	5	15	61	6	10	16	58	5	13	22			
Black	91	14	37	41	163	15	52	32	155	14	39	25			
Other or mixed	48	7	15	31	106	10	26	25	123	11	28	23			
Occupation													8.80	8	.36
Employed or volunteer	83	14	22	27	163	17	38	23	170	18	36	21			
Student	4	1	1	25	10	1	1	10	15	2	4	27			
Homemaker or carer	7	1	3	43	9	1	1	11	15	2	6	40			
Retired or medically retired	22	4	6	27	32	3	5	16	32	3	3	9			
Unemployed	466	80	173	37	751	78	201	27	714	76	202	28			
Marital status													4.06	6	.67
Married or in a partnership	167	26	51	31	276	27	63	23	261	25	56	21			
Divorced or separated	107	17	35	33	185	18	44	24	196	19	46	23			
Single	346	55	135	39	556	53	158	28	555	53	168	30			
Widowed or partner deceased	12	2	6	50	24	2	4	17	31	3	7	23			

[a] Patients with appointments between March 17, 2008, and July 2, 2008, received no short message service (SMS) reminders; patients with appointments between March 16, 2009, and July 2, 2009, received SMS reminders 7 and 5 days before an appointment; and patients with appointments between March 16, 2010, and July 2, 2010, received SMS reminders 7 and 3 days before an appointment. No data were analyzed for appointments for May 11–28 during all three periods.

[b] Percentage of all appointments scheduled during the study period

[c] Percentage of all appointments scheduled in each category of the variable during the study period

[d] The analysis examined whether the distribution of missed and attended appointments differed across the three study periods or whether the distribution of scheduled appointments in the various categories of each variable differed across the three study periods.

Table 2

Characteristics of patients with appointments scheduled during three study periods[a]

Characteristic	March 17–July 2, 2008 (N=480)		March 16–July 2, 2009 (N=757)		March 16–July 2, 2010 (N=769)		F[b]	df	p
	M±SD	Range	M±SD	Range	M±SD	Range			
Age (years)	41.99±12.16	19–78	42.18±11.74	19–79	43.77±11.68	18–79	7.30	2, 1,255	<.001
Appointments	13.72±7.75	1–57	13.46±6.73	1–57	13.23±6.94	1–57	.86	2, 1,255	.42
Prior inpatient admissions	.57±1.08	0–8	.69±1.56	0–15	.63±1.45	0–18	1.27	2, 1,255	.28
Length of last inpatient admission (days)[c]	24.06±43.95	1–550	28.49±66.08	1–983	33.46±79.19	1–983	1.12	2, 408	.33

[a] The patient sample partly overlapped across the three study periods. Excludes patient data for May 11–28 for all study periods
[b] Linear regression analysis for clustered observations; degrees of freedom derived from the number of clusters rather than the number of observations
[c] Subsample of patients with prior inpatient admissions, including 142 in 2008; 241 in 2009; and 240 in 2010

Table 3. After adjusting for the aforementioned confounders, we found that the effect of the SMS intervention on appointment attendance was highly significant (p<.001). Attendance rates during both intervention periods were significantly higher than during the comparison period but did not differ from each other (OR=1.14, CI=.92–1.41, p=.22).

Our primary analysis included only appointments that resulted in attended or DNA outcomes, raising the possibility that reminders simply led to more cancellations. Table 4 presents the numbers and percentage of appointments that resulted in each of four different outcomes (attended, missed, cancelled by patient, or cancelled by clinic or clinician) in the three study periods. Although similar percentages of appointments were cancelled by clients across 2008–2010, a relatively high percentage of cancellations by clinic or clinician was observed in 2010.

The results of the interrupted four-season autoregressive model (SARIMA [1, 0, 0, 4] as best fit), presented in Table 5, support those of the main logistic regression conducted on the restricted sample data. There was a strong decline, by 9% monthly or by 5% every 15 days, in the proportion of missed appointments after the interventions (p=.03). Similarly, there was a strong monthly improvement of 11% in the proportion of appointments attended after the interventions (p=.01).

Discussion

A simple cost-effective delivery of SMS reminders seven and five days or seven and three days before scheduled appointments resulted in a 25% to 28% relative risk reduction in failed attendance at four community mental health clinics in an inner borough of London. The PROMPTS randomized controlled study in Leeds, United Kingdom, reported a

Table 3

Predictors of appointment attendance at four community mental health clinics[a]

Predictor	Wald χ²	df	Odds ratio	95% CI	p
Short message service reminder (reference: none)	20.58	2			<.001
7 and 5 days before appointment			1.75	1.37–2.23	<.001
7 and 3 days before appointment			1.53	1.20–1.95	<.001
Diagnosis (reference: mental or behavioral disorders due to substance use)	31.7	4			<.001
Adult personality or behavior disorders			1.72	1.19–2.48	.004
Neurotic, stress-related, or somatoform disorders			1.91	1.34–2.73	<.001
Schizophrenia or schizotypal or delusional disorders			2.02	1.37–2.98	<.001
Affective or mood disorders			2.68	1.89–3.79	<.001
Clinic (reference: postdischarge)	3.35	3			.34
Assessment			1.17	.57–2.41	.68
Outpatient (a.m.)			1.25	.73–2.16	.41
Outpatient (p.m.)			1.46	.85–2.50	.17
Appointments per patient			1.01	.99–1.03	.19
Prior inpatient admissions per patient			.91	.85–.97	.007
Age			1.03	1.02–1.04	<.001
Race-ethnicity (reference: white)	3.38	3			.34
Asian			1.57	.90–2.73	.11
Black			1.01	.74–1.38	.95
Other or mixed			1.23	.82–1.85	.31
Patient occupation (reference: employed or volunteer)	10.27	4			.04
Student			1.79	.72–4.45	.21
Homemaker or carer			.50	.19–1.31	.16
Retired or medically retired			.67	.34–1.31	.24
Unemployed			.70	.52–.95	.02
Marital status (reference: married or in a partnership)	1.27	3			.74
Divorced or separated			.87	.63–1.21	.42
Single			1.05	.81–1.36	.73
Widowed or partner deceased			1.00	.56–1.77	.99

[a] The analysis included 2,817 appointments scheduled between March 17 and July 2 of 2008, March 16 and July 2 of 2009, and March 16 and July 2 of 2010 and examined the main effect of short message service intervention on appointment attendance, adjusting for variables that significantly predicted appointment attendance in preliminary logistic regression models. No data were analyzed for appointments for May 11–28 in years 2008, 2009, and 2010.

Table 4

Potential outcomes of scheduled appointments at four community mental health clinics, by study period

Outcome	2008		2009		2010	
	N	%	N	%	N	%
Attended	416	47	801	54	796	49
Missed	232	26	280	19	292	18
Cancelled by client	104	12	196	13	214	13
Cancelled by clinic or clinician	136	15	199	14	338	21
Total	888	100	1,476	100	1,640	100

[a] Patients with appointments between March 17, 2008, and July 2, 2008, received no short message service (SMS) reminders; patients with appointments between March 16, 2009, and July 2, 2009, received SMS reminders 7 and 5 days before an appointment; and patients with appointments between March 16, 2010, and July 2, 2010, received SMS reminders 7 and 3 days before an appointment. No data were analyzed for appointments for May 11–28 during all three periods.

closely similar relative risk reduction, 26%, in response to a short orientation letter received by patients three days before a first psychiatric appointment (14). Although the relative risk reductions reported by the two studies fell within the lower end of the ranges reported in the literature (26% to 76%) (5,12–15,38), both studies were significantly larger and more rigorous than other investigations.

Contrary to our hypothesis, reminders delivered in 2010 seven and three days before appointments did not result in a greater reduction in missed appointments than reminders delivered in 2009 seven and five days before the appointments. However, given that the two delivery frames differed by only two days, it would be interesting to examine whether a greater contrast in the timing of reminders would show significant differences in reduction of DNA outcomes (16). Although the percentage of missed appointments was consistently low in both intervention periods compared with the percentage in 2008, an increase in attendance was more clearly observed in 2009 than in 2010, when there was a pronounced increase in cancellations by the clinic or clinician.

The annual direct cost of missed outpatient appointments at hospital clinics in England is estimated to exceed £600 million, or $980 million (2,4). Between 2007 and 2008, 6.5 million appointments were missed, and hospitals lost nearly £100, or $163, per patient in revenue (4). If achieved across the United Kingdom, a relative risk reduction in failed attendance equivalent to the reduction reported in this study would result in national cost savings of well over £150 million, or $245 million, per year (2)

and, most likely, in substantial clinical benefits (6,7,9,10).

Our SMS intervention required minimal investment in information technology infrastructure. The procedure for sending automated SMS was easy to link with existing electronic patient records in the hospital administrative database. In addition, because of the automation of the system, no added labor or staff training was necessary. Notably, using the NHS.net service in the 2010 pilot eliminated any costs associated with sending reminders. It would appear, therefore, that SMS technology can offer a time-, labor-, and cost-efficient strategy for encouraging attendance of psychiatric outpatient services.

This study used an innovative means of addressing a widespread and important problem and, therefore, is of direct clinical importance. It is the largest investigation to date of appointment prompts for psychiatric outpatients. With the exception of a small pioneering study by Pijnenborg and colleagues (32), it is also the first to use SMS-based technology with psychiatric outpatients. In addition, the inclusion criteria in the three study periods eliminated seasonal effects and the effect of confounders associated with mobile phone ownership. The thorough and systematic statistical approach identified several additional confounders and then simultaneously controlled for them in the main regression model. Finally, our alternative statistical analysis increased the generalizability of findings by including all psychiatric outpatient appointments in a large NHS Foundation Trust in England over a period of 2.3 years.

Our study also had limitations. The lack of randomization is an obvious limitation of our design, even though the robust sample size and use of stringent sampling and statistical controls for seasonal, diagnostic, clinical, service, and demographic confounders reduced the risk of unknown systematic differences across the compared study groups. A randomized, controlled trial would have provided a more rigorous approach to attaining our study goals. In the future, therefore, such a trial is warranted to replicate and extend our findings.

Table 5

Interrupted–time-series analysis for 15-day interval data[a]

Variable	Coefficient	z	95% CI	p
Proportion of appointments missed				
Intervention	−.05	−2.14	−.09 to .00	.03
Time interval	.00	−7.14	−.00 to .00	<.01
Time trend	.01	1.80	.00 to .01	.07
Intercept	.30	36.43	.29 to .32	<.01
Proportion of appointments attended				
Intervention	.06	2.47	.01 to .10	.01
Time interval	.00	3.70	.00 to .00	<.01
Time trend	−.01	−1.29	−.01 to .00	.20
Intercept	.43	41.34	.41 to .45	<.01

[a] Four-season first-order autoregressive integrated moving average model for all appointments (N=24,709) scheduled for the continuous period March 2008–July 2010 regardless of diagnosis, ownership of a mobile phone, and appointment outcome

Another limitation of the study is that the two intervention periods could be compared with only one other period, in 2008, because RiO data are not available before October 1, 2007. However, our alternative analysis of the unrestricted data that corrected for time trends supported the results of the main analysis. Finally, it should be emphasized that the pilot nature of this work calls for additional studies to better capture the ways that SMS may influence attendance.

Conclusions

SMS reminders delivered seven and five days and seven and three days before scheduled psychiatric appointments effectively reduced rates of nonattendance in four community mental health clinics in an inner borough of London. The rate of reduction (25% to 28%), combined with the low cost of the SMS intervention and the high cost of missed outpatient appointments, suggests that a large-scale rollout of SMS-based systems in health contexts is likely to result in clinical benefits and substantial cost savings. In England alone, a 25% to 28% reduction in missed outpatient appointments would translate to national cost savings of more than £150 million, or $245 million, per year.

The potential utility of SMS-based approaches for encouraging appointment attendance among psychiatric outpatients relies on the assumption that mobile phone use is widespread in this population, and that SMS reminders are well received. Both assumptions were supported by this study and earlier studies (39,40).

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Submissions for Datapoints Column Invited

Submissions to the journal's Datapoints column are invited. Datapoints encourages the rapid dissemination of relevant and timely findings related to clinical and policy issues in psychiatry. National data are preferred. Areas of interest include diagnosis and practice patterns, treatment modalities, treatment sites, patient characteristics, and payment sources. The analyses should be straightforward, so that the figure or figures tell the story. The text should follow the standard research format to include a brief introduction, description of the methods and data set, description of the results, and comments on the implications or meanings of the findings.

Datapoints columns, which have a one-page format, are typically 350 to 400 words of text with one or two figures. Because of space constraints, submissions with multiple authors are discouraged; submissions with more than four authors should include justification for additional authors.

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