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SHORT COMMUNICATION**Short Message Service (SMS) reminders improve treatment attendance in alcohol dependence, but are less effective for patients high in impulsivity**

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Abstract

Background and Aims

Poor attendance increases the likelihood of relapse in alcohol dependence treatment. Evidence for improved attendance rates following introduction of short message service (SMS) appointment reminders is available in other health care domains. Patients high in impulsivity, characterized by a lack of planning, may particularly benefit from reminders. The study investigated the impact of SMS reminders on outpatient treatment attendance for alcohol dependence, and whether effects were moderated by impulsivity.

Design

Prospective natural history study, with historical case control. Alcohol-dependent outpatients attending treatment received SMS appointment reminders ($n = 102$). These were compared to a historical control group ($n = 91$) treated prior to the introduction of SMS (totalling 1,149 scheduled sessions).

Setting

A metropolitan university hospital alcohol and drug outpatient clinic.

Participants

193 alcohol-dependent patients participated in a 12-week cognitive-behavioural therapy (CBT) program with a treatment goal of abstinence.

Measurements

Trait impulsivity, severity of dependence, psychological distress at baseline.
Attendance at each scheduled session.

Findings

SMS reminders significantly increased probability of session attendance (.90 versus .84, $p = .02$). The effect was qualified by a significant SMS x Impulsivity interaction whereby reminders became less effective with increasing patient impulsivity ($p = .003$).

Conclusions

SMS appointment reminders improve treatment attendance for alcohol-dependent outpatients. More impulsive patients benefited less from reminders, suggesting their non-attendance may be related more to motivational factors.

Keywords: SMS, attendance, treatment compliance, dropout, impulsivity, alcohol.

1. Introduction

Treatment non-attendance for substance use disorder (SUD) patients can greatly affect outcome (Milward, Lynskey, & Strang, 2014). Various studies have investigated predictors of non-attendance in SUD. Greater risk is predicted by being male (Coulson, Ng, Geertsema, Dodd, & Berk, 2009), lower educational attainment (Patkar et al., 2004), being unmarried (Ball, Carroll, Canning-Ball, & Rounsaville, 2006), poor socioeconomic status (SES; Weisner, Mertens, Tam, & Moore, 2001), anxiety (Gudjonsson et al., 2004), impulsivity (Gudjonsson et al., 2004; Moeller et al., 2001; Patkar et al., 2004), and forgetfulness (Sparr, Moffitt, & Ward, 1993). With the increase in adoption of mobile phone technology (95% of Australians; ACMA, 2017) and decrease in cost of the short message service (SMS), various health disciplines have started using outpatient appointment reminders to improve attendance (Foley & O'Neill, 2009; Louch, Dalkin, Bodansky, & Conner, 2013). This report is the first evaluation of the effectiveness of SMS reminders for outpatient alcohol dependence treatment.

Research examining SMS reminders has been restricted to non-addiction health services, but show efficacy in improving attendance (Battistotti, Quaglini, & Cuoco, 2006; Berrouiguet, Baca-García, Brandt, Walter, & Courtet, 2016). Guy et al. (2012) conducted a meta-analysis of 18 studies, demonstrating clinic attendance improved by 50% when patients were notified by SMS for their upcoming appointment/s, compared to patients not reminded. The effect was not influenced by clinic type, message timing, or patient age. Kunigiri and colleagues (2014) reported an 11% increase in follow-up attendance for 193 UK psychiatric outpatients. Downer and colleagues (2006) reported a 90.2% attendance rate at a public children's hospital outpatient service for those receiving SMS reminders, compared to 80.5% for those who did not. The effect of SMS reminders on attendance is similar to telephone reminders, but more cost effective (Car, GuroI-Urganci, de Jongh, Vodopivec-Jamsek, V, &

Atun, 2012).

A trait often associated with SUD is impulsivity, broadly defined as the tendency to engage in behaviours that are rewarding in the short term, but maladaptive in the long term (Gullo, Loxton, & Dawe, 2014; Moeller, Barratt, Dougherty, Schmitz, & Swann, 2001). Impulsivity is causally linked to alcohol use and associated with poorer treatment outcome (Gullo et al., 2017; Loree, Lundahl, & Ledgerwood, 2015). Moeller and colleagues (2001) reported higher rates of treatment dropout in patients with higher scores on the Barratt Impulsiveness Scale (Patton, Stanford, & Barratt, 1995), which measures lack of planning, attentional difficulties, and motor disinhibition. To the extent that impulsivity conveys risk for non-attendance through planning or attentional difficulties (i.e., forgetting the appointment), impulsive patients may particularly benefit from SMS reminders (Butz & Austin, 1993). A study of SMS reminders for insulin injection in Type 1 diabetics found that they were only effective for impulsive patients, who were more likely to otherwise forget (Louch et al., 2013). In this study, it was hypothesized that SMS reminders would significantly improve outpatient treatment attendance and that this effect would be moderated by impulsivity, such that more impulsive patients would demonstrate greater benefit from reminders.

2. Method

2.1 Participants and Procedures

Data were extracted from clinic records on 193 treatment-seeking alcohol-dependent patients attending an outpatient alcohol and drug clinic at a large Australian metropolitan university teaching hospital. Clinic patients are referred through several mechanisms, including consultation-liaison assessment during hospital inpatient stay, outpatient gastroenterology, and through primary care- or self-referral. All patients met criteria for

alcohol dependence according to the Diagnostic and Statistical Manual of Mental Disorders (4th ed.), as assessed by a clinic physician, nurse, or clinical psychologist. The intervention group ($n = 102$) included all patients engaged in treatment for the 6-month period after the introduction of SMS appointment reminders (27 January - 31 July 2016). The historical control group ($n = 91$) included all patients engaged in treatment during the same period in the previous calendar year (27 January - 31 July 2015). All sessions within the 6-month study window were included for analysis, including those of patients who had already commenced treatment at the opening of the window and those who commenced treatment and would still be attending after the close of the 6-month window. Sample characteristics are reported in Table 1.

INSERT TABLE 1 HERE

SMS reminders were sent 24 hrs prior to a scheduled session using the MessageMedia platform (www.messagemedia.com.au). Reminders were limited to 160 characters and cost AUD 12.5 cents/SMS. While the platform allows message customization, all patients received the same reminder, e.g., “Reminder: PAH Alcohol & Drug Unit, Wednesday, 03/02/2016 at 09:00. Phone 3176 5191 if unable to attend. DO NOT REPLY”. Treatment involved one-to-one Cognitive-Behavioral Therapy (CBT) with an abstinence goal. It comprised eight 1-hour sessions delivered over 12 weeks (four weekly sessions, then four fortnightly sessions). The manualized abstinence-based program contains defined cognitive and behavioral components conducted by clinical psychologists and focused on four core areas: (a) identification and modification of alcohol expectancies, (b) increasing drinking refusal self-efficacy, (c) developing more effective coping strategies, and (d) teaching problem-solving skills. Treatment was delivered by Masters- or Doctoral-qualified clinical

psychologists. Pre-treatment assessment data were collected immediately prior to the first treatment session. Human research ethics approval was obtained from both hospital (HREC/17/QPAH/238) and university (2017000518) IRBs to analyse an existing deidentified dataset.

2.2 Measures

2.2.1 Alcohol dependence severity. The Severity of Alcohol Dependence Questionnaire (Stockwell, Murphy, & Hodgson, 1983) includes 20 items based on Edwards and Gross' (1976) alcohol dependence syndrome. It has good construct validity and test-retest reliability (Stockwell et al., 1983). The 10-item Alcohol Use Disorders Identification Test (Saunders, Aasland, Babor, de la Fuente, & Grant, 1993) is an established screening measure of hazardous drinking and alcohol-related problems. It has good reliability, sensitivity and specificity, and discriminant validity (Saunders et al., 1993).

2.2.2 Impulsivity. The 12-item Dickman (1990) Dysfunctional Impulsivity scale measures the component of impulsivity related to disinhibition and the tendency to act without forethought (Franken & Muris, 2006; Gullo et al., 2014). It has good reliability and construct validity (Dickman, 1990; Franken & Muris, 2006; Smillie & Jackson, 2006).

2.2.3 Psychological functioning. The 28-item General Health Questionnaire (GHQ-28; Goldberg & Williams, 1988) was used to assess recent changes in *Depression*, *Anxiety*, *Somatic Symptoms*, and *Social Dysfunction*. The GHQ is a widely used measure of psychological health and has strong psychometric properties (Goldberg et al., 1997).

2.2.4 Session attendance. All scheduled sessions were coded as "0" if the patient did not attend and "1" if the patient attended.

2.3 Data analysis

The outcome of interest was probability of session attendance. The effect of SMS reminders and impulsivity were analyzed using multilevel modelling (MLM), an approach particularly suited to analysing clustered data (i.e., sessions nested within patients; Hox, 2002). MLM is well-suited to naturalistic settings where the number and frequency of data points vary across individuals. Probability of session attendance was analysed with a random-intercepts generalized linear model utilising a logit link function and Taylor series expansion. SMS Reminder, Impulsivity, and the SMS x Impulsivity interaction were entered simultaneously into the model. Coefficients represent logit transformed probabilities.

3. Results

Of the 1,149 scheduled sessions in the study period, 34 (3.0%) were coded as missing because they fell on days in which SMS reminders were not sent due to technical fault or administrative staff absence. For balance, the corresponding 17 days in the historical control period were also coded as missing. Grand mean probability of attendance was .85, 95% CIs [.82, .88]. Little's (1988) Missing Completely At Random (MCAR) test on baseline data was not significant, $\chi^2(19) = 28.66, p = .072$. Variables listed in Table 1 not of primary interest were examined as potential covariates. Age (*unstandardized coeff.* = 0.05, *SE* = 0.01, $p < .001$) and GHQ-Social Dysfunction (*unstandardized coeff.* = 0.069, *SE* = 0.035, $p = .048$) were significant predictors of attendance in a covariates-only model. However, their inclusion in the hypothesized model did not affect parameter estimates and were not retained.

The hypothesized model revealed a significant increase in probability of attendance due to SMS reminders (see Table 2). Estimated probability of attendance for patients receiving reminders was .90 compared to .84 for those who did not - a 7% increase. There was a non-significant trend of impulsivity reducing overall probability of attendance. However, both effects were qualified by a significant SMS x Impulsivity interaction, such

that the benefit of SMS reminders reduced with increasing impulsivity. For comparison, SMS patients low in impulsivity (-1 *SD* below mean) were estimated to have a .96 probability of session attendance compared to only .78 for SMS patients high in impulsivity (+1 *SD*).

When the effect of SMS reminders were modelled for the 38 patients scoring $\geq +1$ *SD* above the mean on impulsivity ($n = 224$ scheduled sessions), it was not statistically significant (*unstandardized coeff.* = -0.66, *SE* = 0.45, $p = .14$).

INSERT TABLE 2 HERE

4. Discussion

This study reports the first evaluation of SMS appointment reminders for outpatient alcohol treatment attendance. As predicted, SMS reminders increased the probability of attendance, as in other health fields (Guy et al., 2012). The increase occurred within the context of a high baseline attendance rate (.84). In the outpatient unit studied, located within a metropolitan university teaching hospital, the 7% increase in attendance equated to a saving of approximately 2 psychologist sessions per week. While a formal cost-effectiveness evaluation was beyond the scope of this study, the improvement equates to approximately AUD\$18,000 per annum in staff time alone. The increase in attendance observed is comparable to that reported by Downer et al. (2006) in a children's outpatient clinic at another large Australian public hospital. It is also comparable to the 11% increase reported in British psychiatric outpatients (from a lower baseline of 72%; Kunigiri et al., 2014). This study provides consistent evidence for the effectiveness of SMS reminders in an outpatient alcohol-dependent population.

The effectiveness of SMS reminders were not uniform. Patient impulsivity moderated effectiveness, but in the opposite direction to that hypothesized. It was hypothesized that

reminders would be particularly helpful for these patients to the extent that their non-attendance was attributable to lack of planning or inattention (Patton et al., 1995). Observing the opposite pattern suggests that there may be more challenging motivational factors at play for impulsive patients. Further research is required to confirm this.

Patients high in impulsivity may benefit more from SMS reminders that include motivation-enhancing content. Impulsivity is associated with a greater propensity to discount delayed rewards (such as those associated with successful treatment; Duckworth & Kern, 2011), low abstinence self-efficacy (Gullo, Dawe, Kambouropoulos, Staiger, & Jackson, 2010), and a greater likelihood of treatment dropout and relapse (Loree et al., 2015). Reminders that include information about long-term benefits of continued abstinence may increase the salience of these health and social rewards, thereby enhancing motivation (Chow et al., 2015). Alternatively, SMS content could aim to increase self-efficacy by providing positive reinforcement for progress already made and reminders of short-term social benefits from treatment engagement; for example, making family members proud (Haug, Lucht, John, Meyer, & Schaub, 2015). This focus could have been a factor in the enhanced effects observed among impulsive diabetic patients by Louch et al. (2013) that were not found in the present sample. Lastly, impulsivity is a multidimensional trait and examination of specific components may also provide insights into how best to target SMS reminders (Gullo et al., 2014).

This study provides preliminary evidence for the effectiveness of SMS appointment reminders in outpatient alcohol treatment. The lack of randomization is a limitation. Generalization to other substance use disorders should be made with caution. Our results and those from other health domains do suggest that appointment reminders are unlikely to have a negative effect. It is also important not to conflate session non-attendance with treatment dropout, although the two are related (Milward et al., 2014). Future research should

investigate the efficacy of targeted SMS content, which may produce further improvements in treatment engagement. With greater personalization comes greater implementation cost, which may prompt an important line of future research into the cost-effectiveness of different SMS approaches. Here we demonstrate that a simple, easy-to-implement, SMS appointment reminder system improved treatment attendance for most patients.

Author Disclosures

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Contributions: MJG was responsible for the study design and concept. KI and MJG undertook the literature review, data analysis and wrote the first draft of the manuscript. MJG, KI, JPC and GF all contributed to subsequent revisions and editing of the manuscript.

Conflicts of Interest: No conflict declared.

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Table 1 *Descriptive Statistics for Outpatients Receiving SMS reminders and Historical Controls.*

	Control Group (<i>n</i> = 91)	SMS Reminder Group (<i>n</i> = 102)	<i>t</i> or χ^2	<i>p</i>
Age (years)	43.47 (10.75)	45.67 (9.60)	1.50	.14
Gender (%)			2.05	.15
Male	70 (76.9%)	69 (67.6%)		
Female	21 (23.1%)	33 (32.4%)		
AUDIT Total (Cronbach's α = .88)	28.51 (8.51)	28.39 (9.48)	0.09	.93
Alcohol Dependence Severity (SADQ Total, α = .93)	25.62 (12.45)	22.25 (13.11)	1.81	.07
Impulsivity (α = .77)	4.75 (3.10)	4.53 (3.01)	0.47	.64
General Health Questionnaire	7.32 (4.36)	7.80 (4.97)	0.71	.48
Somatic Symptoms (α = .85)	9.31 (4.81)	9.82 (5.69)	0.67	.50
Anxiety (α = .90)	8.51 (3.98)	10.34 (4.96)	2.80	.006
Social Dysfunction (α = .88)	5.77 (4.69)	7.30 (6.32)	1.90	.06
Depression (α = .91)				
Treatment Sessions Attended	5.01 (3.31)	4.62 (3.25)	0.82	.42

Note. AUDIT = Alcohol Use Disorders Identification Test (Saunders et al., 1993); SADQ = Severity of Alcohol Dependence Questionnaire (Stockwell et al., 1983).

Table 2 *Effect of SMS Reminders and Impulsivity on Treatment Attendance.*

Parameter	Unstandardized coefficient	SE	z	p
<i>Fixed effects</i>				
Constant, β_{0j}	1.67	0.15		
SMS Reminder, β_{1ij}	0.56	0.24	2.27	.022
Impulsivity, β_{2ij}	-0.09	0.05	1.91	.056
SMS Reminder x Impulsivity, β_{3ij}	-0.24	0.08	2.94	.003
<i>Random effects</i>				
σ^2_{u0}	0.63	0.23		

Note. SMS Reminder: 0 = No, 1 = Yes; Impulsivity scores were grand-mean centered. Boldface indicates $p <$

.05.

Highlights

- SMS reminders increased alcohol outpatient attendance ($p = .02$)
- SMS led to 7% increase in probability of session attendance
- Impulsive patients benefited less from SMS reminders