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ORIGINAL ARTICLE

Predictors of Inpatient Care in a 10-Year Retrospective Cohort Registered in an Outpatient Substance Use Disorder Treatment Program

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Abstract

The intensity of the treatment need for substance use disorders (SUD) varies across individuals and time. Under-treatment leads to poor outcome, and over-treatment increases the cost of care. The present study aimed to determine the predictors for inpatient treatment within the first 6 months of registration in an outpatient treatment program. This was a retrospective cohort study of consecutive patients registered in a multi-disciplinary outpatient treatment program between January 1, 2009, and December 31, 2018, and followed-up at least for 6 months. In the initial 6 months, 407 (15.67%) out of 2597 patients were admitted for inpatient care. The clinical characteristics independently predicting inpatient treatment were absence of maintenance pharmacotherapy ($p < 0.001$; OR: 3.375; 95% CI: 2.38–4.77), heroin use and injection opioid use ($p = 0.001$; OR: 1.924; 95% CI: 1.311–2.823 and $p = 0.050$; OR: 1.635; 95% CI: 1.000–2.673, respectively), presence of co-occurring common mental disorders ($p = 0.031$; OR: 1.987; 95% CI: 1.065–3.708), severe mental illness ($p = .009$; OR = 1.727; 95% CI: 1.144–2.605), and greater number and duration of substance use ($p = 0.009$; OR: 1.303; 95% CI: 1.068–1.591 and $p < 0.001$; OR: 1.003; 95% CI: 1.002–1.005, respectively). Other clinical and demographic factors that were associated with a higher risk of transition from outpatient to inpatient treatment were unemployment, urban residence, and self-referral to treatment. The risk factors for transition from outpatient to inpatient treatment could help in prioritization of inpatient admission, appropriate patient placement, and making early decisions on level of care.

Keywords Predictors · Inpatient admission · Substance use disorders

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Introduction

The intensity of the treatment need varies among individuals with substance use disorders (SUD). Identification of treatment needs based on a specific set of criteria determines the intensity of treatment. The principle of patient treatment matching is the key to the patient placement criteria (Hoffman et al., 1987; Morey, 1996; Gastfriend et al., 2003). The evidence consistently demonstrated that "under-treatment" (i.e., receiving outpatient-based less intensive care, when an intensive outpatient or inpatient care would be warranted) led to poor outcome in terms of poorer treatment retention, greater use of drug and alcohol, and significantly higher hospital utilization. Moreover, "over-treatment" did not improve outcome, rather increased the cost of care (Magura et al., 2003a, b; Sharon et al. 2004; Stallvik et al., 2015). In sum, appropriate choice of the treatment setting and intensity influence outcome and ensure optimal utilization of resources. Therefore, resource poor countries could learn and adopt a similar approach to maximize the unitization of their limited resources.

A recent nationwide survey from India reported that more than 75% of individuals with drug and alcohol use disorders do not receive any help and one in five of those receiving treatment has received inpatient care (MSJE 2019). The treatment gap is attributed to the limited availability and access to care. There are only about 122 de-addiction centers and ten Regional Resource and Training Centers for the entire country. Many of these do not have the full continuum of services (Avasthi & Ghosh, 2019). Furthermore, existing treatment services for SUD in India differ significantly from both the UK and other European countries and from the USA because of the following: (a) It is neither entirely publicly funded nor supported by insurance system (unlike the managed care in the US), (b) the services provided by both public and private providers, (c) the cost of treatment is largely borne by the service users (i.e., out of pocket), and (d) there is no mandated guideline to decide the treatment settings, intensity, and duration; hence, the level of care is determined by service providers' and users' convenience, availability of resources, and influence of the family and relatives. All these factors together could lead to under- or over-treatment and misuse of the already compromised resources. These factors are common to several South East Asian and low middle-income countries (Salwan & Katz, 2014).

In the absence of definite patient placement criteria, finding the predictors of hospitalization could aid in early identification of the group that might require more intensive treatment than standard outpatient care. Research in this area, however, is very limited. A study among the Veteran Health Administration Department showed presence of comorbid severe mental illness, common mental disorders, older age, unemployment, homelessness, and suicide risk predicted high inpatient utilization (Painter et al., 2018). Another study from the USA found that patients with opioid use disorders and those on Medicaid (as opposed to private insurance) were less likely to receive inpatient detoxification (Zhu & Wu, 2018). Thus, there was a need to study the predictors of inpatient SUD treatment from a different country that does not follow any placement criteria. The objective of our study was to determine the predictors of the requirement for inpatient treatment (first admission) within the first 6 months of recruitment to an outpatient treatment program for SUD.

Methods

Design

This was a retrospective cohort study.

Settings

The study was conducted at the Drug De-addiction and Treatment Centre (DDTC) at the Postgraduate Institute of Medical Education and Research (PGIMER), a publicly funded tertiary care hospital in Chandigarh, India. Established under the mandate of the Drug De-Addiction Program of the Ministry of Health and Family Welfare, Government of India in 1988, the DDTC caters to six neighboring states of Northern India. It runs both an outpatient (OP) and inpatient (IP) treatment program. Patients registered in the center, after screening and initial management in the walk-in clinic, receive a multidisciplinary OP care. IP admission is based on the response to OP treatment and generally happens within the first 6 months of treatment initiation. However, we do not follow any definite patient placement criteria. A detailed description of the OP services has been provided elsewhere (Ghosh et al., 2020).

Sample

The study included all consecutive patients registered for detailed evaluation in the outpatient treatment program between January 1, 2009, and December 31, 2018, and followed-up at least for 6 months. Patients dropping out before the detailed evaluation or admitted to the inpatient unit on the same day of detailed evaluation were excluded from the study.

Outcome

Inpatient admission within the first six months of recruitment to the outpatient treatment program.

Predictors and Effect Modifiers

The list of predictors was based on the dimensions of patient placement criteria and availability of recorded data (Morey, 1996; Magura et al. 1996). We included predictors such as presence of physical comorbidity as biomedical condition, dual diagnosis as emotional and behavioral complications, family structure, marital status, and employment under external factors influencing relapse potential and recovery environment, and prescription of maintenance treatment for relapse prevention as a biological predictor for relapse prevention. We classified the psychiatric comorbidities in to two distinct categories: severe mental illness (schizophrenia and other psychotic spectrum disorders, bipolar disorder, recurrent depressive disorder) and common mental illness (major depressive episode, anxiety disorders, dysthymia, other stress-related disorders) (National Collaborating Centre for Mental Health (UK), 2011; Whitley et al., 2015). Mode of referral (self-versus others) was a proxy indicator of motivation (treatment seeking by self, suggested higher level of motivation). We included potential effect modifiers like the age, duration and the number of substance use, injection drug use, type of primary substance of abuse, and nicotine dependence.

Sample Size Estimation

We had a total of 18 predictor variables. According to the event per variable (EPV) 50 formula ($n = 100 + 50i$ where i refers to number of independent variables in the final model), the estimated sample size was at least 1000 (Bujang et al., 2018).

Data Collection and Measures

We used computerized databases for data extraction. The records consisted of the date of detailed assessment, demographic details, substance use and mental health characteristics, and setting of treatment. Age, education, duration of drug use, and number of substances were continuous variables; the rest were categorical variables (e.g., dual diagnosis, comorbid physical disorders, distance from the treatment center, etc.). We labeled the categorical variables. The socio-demographic and clinical details of the group of patients treated exclusively in the outpatient program were compared with the group that was managed as inpatient with independent sample *t*-test. For variables showing between-group differences at $p \leq 0.05$, a step-wise binary logistic regression analysis was applied to see whether any of these variables significantly and independently predicted the inpatient admission. We assessed the model fitness by log likelihood estimation. We also estimated the percentage accuracy in classification and model variance. The data was analyzed using SPSS version 19 (IBM Corp., NY, USA, 2010).

Bias and Measures Taken

Retrospective studies are prone to selection bias. However, in our study, we could retrieve records of all patients registered during the study period and were retained in the outpatient treatment program for at least 6 months. Therefore, selection bias was unlikely. Our study was record-based and that must have minimized the recall bias.

Ethical Clearance

The Institute Ethics Committee approved the study (IEC reference number INT/IEC/2020/000436).

Results

A total of 8640 patients were registered for detailed evaluation during the study period. Two thousand six hundred forty-six patients dropped out after initial evaluation, and 603 were admitted on the same day of outpatient evaluation. One hundred twenty (19.9%) of these 603 patients had dual diagnosis, and 200 (33.2%) had complicated withdrawal (e.g., delirium tremens, withdrawal seizure) requiring medically monitored inpatient care. The other reasons for direct transfer to the inpatient care were unstable family and social support, past history of complicated withdrawal, long travel distance making attendance in the outpatient program difficult, and court-mandated inpatient treatment. We excluded these 603 patients from the analysis because they were never enrolled in the outpatient program. The 2597 patients retained in the treatment at 6 months were analyzed for our study. Please see the flow diagram (Fig. 1).

Sample Characteristics

The mean age of the sample was 34.10 (± 11.11) years. Most of the participants were from a distance of up to 160 km (86.06%), employed (63.38%), currently married (62.61%),

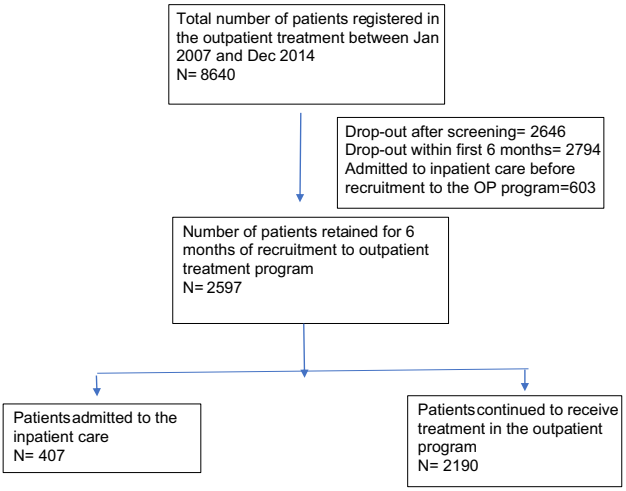

Fig. 1 Study flow diagram

from urban locality (54.10%), and nuclear family (47.98%). Only a quarter (24.45%) of patients were self-referred, and the rest were referred by others (relatives or doctors). The mean duration of substance use was 152.52 (±114.26) months. Most commonly used primary substances were opioid (45.48%) and alcohol (43.82%). Use of natural opioids (35.56%) was more prevalent than chasing heroin (21.24%). Injecting drug use (heroin, buprenorphine, pentazocine) was reported by 9.75%. Only 11% patients had physical comorbidities. Dual diagnosis, present in 16.33% of the sample, included severe mental illness (SMI) such as schizophrenia, bipolar affective disorder in 11.09%, and common mental illness (CMI) such as depression and anxiety disorder in 5.24%. It is important to note that we excluded 120 patients with dual diagnosis because they were admitted to inpatient care on the day of detailed evaluation: 110 (91.7%) of these had comorbid SMI and 10 (8.3%) had CMI. Maintenance pharmacotherapy was prescribed to 87.99% of all patients. This included medication-assisted treatment for opioid use disorders, naltrexone, disulfiram, acamprosate, baclofen, and topiramate for alcohol use disorders. Please see Table 1 for further details on sample characteristics.

Out of 2597 patients, 2190 (84.33%) were managed exclusively in the outpatient setting, while the remaining 407 patients (15.67%) required inpatient treatment at some point in time during the first 6 months.

Comparison of Groups Receiving Exclusive Outpatient Versus Inpatient Treatment

Compared to the patients treated exclusively as outpatient, the patients who received inpatient care were more often unemployed ($p=0.004$*) and from urban locality ($p=0.003$*). A significant proportion ($p=0.014$*) of the inpatient group were referred by other sources. In terms of substance use characteristics, as compared to the exclusive outpatient group, the inpatient group had greater duration of substance use ($p=0.001$*) and was using a greater number of substances ($p=0.001$*). A significant association of inpatient care was observed in patients with dependence on heroin, injection opioid use, and dual diagnosis

Table 1 Sample characteristics and comparison between patients required inpatient versus outpatient treatment for SUD

Socio-demography and clinical characteristics (***N***=2597)	Frequency (%) Mean (±SD)	Inpatient care [***N***=407] Frequency (%)/mean (±SD)	Outpatient care [***N***=2190] Frequency (%)/mean (±SD)	t-value/chi-square / Mann–Whitney ***U***	***p***-value
Age (years)	34.10 (±11.11)	33.58 (±10.34)	34.19 (±11.24)	t 1.02; F2.643	0.310
Marital status					
• Currently single	971 (37.39%)	164 (40.29%)	807 (36.85%)	1.74#	0.187
• Currently married	1626 (62.61%)	243 (59.71%)	1383 (63.15%)		
Education (years)	10.62 (±3.95)	10.46 (±3.96)	10.65 (±3.94)	t 0.89; F0.10	0.374
Occupation					
• Unemployed	951 (36.62%)	175 (42.99%)	776 (35.43%)	8.460#	**0.004***
• Paid wagers	1646 (63.38%)	232 (57.01%)	1414 (64.57%)		
Family type					
• Nuclear	1246 (47.98%)	212 (52.09%)	1034 (47.21%)	3.266#	0.071
• Extended/joint	1351 (52.02%)	195 (47.91%)	1156 (52.79%)		
Locality					
• Urban	1405 (54.10%)	248 (60.93%)	1157 (52.83%)	9.074#	**0.003***
• Rural	1192 (45.90%)	159 (39.07%)	1033 (47.17%)		
Distance					
• Up to 160 km	2235 (86.06%)	344 (84.52%)	1891 (86.35%)	0.954#	0.329
• More than 160 km	362 (13.94%)	63 (15.48%)	299 (13.65%)		
Mode of referral					
• Self	635 (24.45%)	80 (19.66%)	555 (25.34%)	6.008#	**0.014***
• Others	1962 (75.55%)	327 (80.34%)	1635 (74.66%)		
Number of substances	1.72 (±0.72)	1.83 (±0.76)	1.70 (±0.71)	*t* −3.27; *F* 0.567	**0.001***
Duration of use (in months)	152.52 (±114.26)	170.27 (±113.02)	149.22 (±114.21)	*t* −3.42; *F* 0.013	**0.001***
Nicotine					
• Yes	1368 (52.68%)	228 (56.01%)	1140 (52.05%)	2.164#	0.141
• No	1229 (47.32%)	179 (43.98%)	1050 (47.95%)		

Table 1 (continued)

Socio-demography and clinical characteristics (***N*** = 2597)	Frequency (%) Mean (± SD)	Inpatient care [***N*** = 407] Frequency (%)/mean (± SD)	Outpatient care [***N*** = 2190] Frequency (%)/mean (± SD)	t-value/chi-square / Mann–Whitney ***U***	***p***-value
Physical comorbidity					
• Yes	267 (10.28%)	32 (7.86%)	235 (10.73%)	3.061#	0.080
• No	2330 (89.72%)	375 (92.14%)	1955 (89.27%)		
Main substance					
• Alcohol	1138 (43.82%)	175 (44.10%)	963 (44.92%)	6.835#	0.145
• Opioid	1181 (45.48%)	200 (46.7%)	981 (45.43%)		
• Cannabis	101 (3.89%)	14 (4.3%)	87 (4.18%)		
• Nicotine	138 (5.31%)	12 (4.8%)	126 (3.91%) **[Z = 2.3]***		
• Others	39 (1.50%)	6 (1.5%)	33 (1.56%)		
Type of Opioid					
• Natural	489 (35.56%)	50 (23.38%)	435 (38.02%) **[Z = 4.8]***	47.027#	**< 0.001**
• Heroin (chasing)	292 (21.24%)	59 (23.81%)	233 (20.37%)		*
• IDU (injection heroin/ buprenorphine/pentazocine	134 (9.75%)	46 (19.91%) **[Z = 5.7]***	88 (8.04%)		
	460 (33.45%)	76 (32.90%)	384 (33.57%)		
• Others (tramadol/CCCS/DPP tapentadol/diphenoxylate/mixed)					
Opioid					
• Heroin	426 (30.98%)	105 (45.45%)	321 (28.06%)	27.197#	**< 0.001**
• Non-heroin	949 (69.01%)	126 (54.55%)	823 (71.94%)		*
Opioid					
• IDU	134 (9.75%)	48 (20.78%)	86 (7.52%)	41.439#	**< 0.001***
• Non-IDU	1241 (90.25%)	183 (79.22%)	1058 (92.48%)		
Maintenance pharmacotherapy					
• Given	2285 (87.99%)	293 (71.99%)	1992 (90.96%)	116.828#	**< 0.001***
• Not given	312 (12.01%)	114 (28.01%)	198 (9.04%)		

Table 1 (continued)

Socio-demography and clinical characteristics (***N*** = 2597)	Frequency (%) Mean (± SD)	Inpatient care [***N*** = 407] Frequency (%)/mean (± SD)	Outpatient care [***N*** = 2190] Frequency (%)/mean (± SD)	t-value/chi-square / Mann–Whitney ***U***	***p***-value
Dual diagnosis					
• Yes (SMI)	288 (11.09%)	72 (17.69%)	216 (9.86%)	21.50[#]	**< 0.001**
• Yes (CMI)	136 (5.24%)	18 (4.42%)	118 (5.39%)		*
• No dual diagnosis	2173 (83.67%)	317 (77.89%)	1856 (84.75%)		

[#]Chi-square value

[*]$P < 0.05$

SMI severe mental illness, *CMI* common mental illness, *IDU* injecting drug use, *CCCS* codeine containing cough syrup, *DPP* dextropropoxyphene

(all $p < 0.001$). We observed that a significantly higher ($p < 0.001$) proportion of OP group had received maintenance pharmacotherapy. Table 1 provides the detailed comparisons.

Predictors of Inpatient Admission

All variables that were significant at $p \leq 0.05$ in the univariate analysis were entered as predictors or effect modifiers into the step-wise logistic regression model. All the clinical and demographic variables that were significant in the univariate analysis were entered in the logistic regression model to identify the independent predictors of inpatient admission. The log likelihood estimation showed that the present model was statistically significant, $\chi^2(4) = 1117.457$, $p < 0.0005$. The model classifies 84.5% cases correctly. The variance (Nagelkerke R^2) explained by this model was 14.9%. The odds of inpatient treatment were significantly higher in (1) nonprescription of maintenance pharmacotherapy ($p < 0.001$; OR: 3.375; 95% CI: 2.38–4.77), (2) longer duration of substance use ($p < 0.001$; OR: 1.003; 95% CI: 1.002–1.005), (3) higher number of substances used ($p = 0.009$; OR: 1.303; 95% CI: 1.068–1.591), (4) use of heroin ($p = 0.001$; OR: 1.924; 95% CI: 1.311–2.823), especially injections opioid use ($p = 0.050$; OR: 1.635; 95% CI: 1.000–2.673), (5) severe mental illnesses (SMIs) such as schizophrenia and bipolar disorder ($p = 0.009$; OR = 1.727; 95% CI: 1.144–2.605), and (6) common mental disorders (CMDs) such as depression and anxiety ($p = 0.031$; OR: 1.987; 95% CI: 1.065–3.708).

Discussion

We intended to determine the predictors of first inpatient treatment for substance use disorders within 6 months of registration to an outpatient treatment program. We analyzed more than two thousand five hundred patients registered and retained at 6 months, in the last 10 years in an outpatient clinic of Northern India. To the best of our knowledge, ours is one of the few studies with similar objectives and the only study from the South East Asian region. We found the following clinical characteristics independently predicted inpatient treatment for SUD: absence of maintenance pharmacotherapy, heroin uses and injection opioid use, presence of co-occurring disorders, and greater numbers and duration of substance use. Other clinical and demographic factors that might be associated with a higher risk of transition from outpatient to inpatient treatment were unemployment, urban locality, and self-referral; however, these factors did not retain statistical significance in the multivariate analysis.

Limited published research on the predictors of first inpatient admission in SUD has made it difficult to test the veracity of our results. Higher risk of requiring inpatient treatment among those with heroin use and injection opioid use than those with natural opioids use might suggest greater social-cultural acceptance of the latter (Parmar et al., 2018). This might also be because of a possible lower addiction severity in the group dependent on natural opioids (Parmar et al., 2017). Reduced odds of inpatient treatment among those on maintenance medication for alcohol and opioid use disorders, too, was in line with the existing evidence. Medications for the treatment of alcohol and opioid use disorders reduce frequency of drinking and heavy drinking and increase the duration of abstinence and use of illicit opioids (Douaihy et al., 2013). Improved outcome would reduce the need for more intensive care.

Higher risk of requiring inpatient treatment among those with co-occurring disorders was also in line with the evidence in the literature. Painter et al. (2018) reviewed the medical records of patients with SUDs and found that a significantly larger proportion of patients (82%) with SUD and comorbid psychiatric disorder needed intensive inpatient care than those without comorbidities. A significantly larger proportion (more than 90%) of patients with comorbid SMI required inpatient treatment right from the day of detailed evaluation and were thereby excluded from the study. This could explain the apparent paradoxical finding of higher odds of inpatient treatment need in comorbid CMI. Higher likelihood of the requirement of inpatient treatment for patients with greater duration and numbers of substance use could be related to the poor outcome of treatment in this group (Ciraulo et al., 2003). Polysubstance use has consistently been associated with poorer treatment retention, higher rates of relapse, and a threefold higher mortality rate compared to single-substance use (de la Fuente et al., 2014; Staiger et al., 2013; Williamson et al., 2006). These clinical characteristics could also indicate higher addiction severity, which in itself is an independent predictor of poor treatment outcome (Adamson et al., 2009).

Our study results should be read in light of the following limitations. This was a retrospective study, and we analyzed pre-recorded data. Therefore, we could not examine the role of other potential predictors such as motivation for treatment, adherence to the outpatient treatment program, and severity of substance use. Although the data were recorded by a qualified psychiatrist, critiques might question the reliability of retrospective data. The reasons for transition from an outpatient treatment program to inpatient care could be (a) failure of the outpatient program or (b) inappropriate patient placement at the intake or both. Our study could not answer this question. We used the step-wise binary logistic regression model to estimate the odds ratios and confidence

Table 2 Predictors of inpatient care

Predictors	β	SE β	Wald's $\chi 2$	df	P	Eβ (odds ratio)	95% CI for eβ
Constant	−3.327	0.291	131.038	1	**< .001***	0.036	-
Duration of use	0.003	0.001	14.288	1	**< .001***	1.003	1.002–1.005
Number of substances	0.265	0.102	6.808	1	**0.009***	1.303	1.068–1.591
Urban locality Ref. rural	0.170	0.156	1.999	1	0.274	1.186	0.874–1.609
Unemployed Ref. employed	0.276	0.160	2.978	1	0.084	1.318	0.963–1.802
Referred by self Ref. referred by others	−0.248	0.181	1.880	1	0.170	0.780	0.547–1.113
Opioid heroin Ref. non-heroin use	0.654	0.196	11.169	1	**0.001***	1.924	1.311–2.823
Opioid-injecting drug use Ref. non-IDU	0.492	0.251	3.846	1	**0.050***	1.635	1.000–2.673
Maintenance pharmacotherapy							
Not given	1.217	0.177	47.480	1	**< .001***	3.375	2.388–4.771
Ref. given							
Dual diagnosis							
CMI	0.687	0.318	4.658	2	**0.031***	1.987	1.065–3.708
SMI No dual diagnosis (reference)	0.546	0.210	6.770		**0.009***	1.727	1.144–2.605

*$P < 0.05$; *SMI* severe mental illness, *CMI* common mental illness, *IDU* injecting drug use

intervals of the potential predictors of inpatient care (Table 2). Log-binomial model and the Cox or Poisson models with adjusted variances are alternative models for point and interval estimates (Barros & Hirakata, 2003). These models may have a lesser chance of overfitting. Finally, ours was a single-center study. In the absence of definite placement criteria, different centers in India practice different guidelines for inpatient care. Therefore, the results of our study should be replicated in a multi-centric context for generalization.

In sum, our study could inform the clinicians about the potential risks for transition from an outpatient to an inpatient treatment program. These risk factors could help a clinician in early decision-making and appropriate patient placement and would be more useful in clinics without any definite guidelines for the required level of care. Our results might also encourage the policy makers framing guidelines on prioritizing the level of care for patients with SUD and optimal utilization of limited resources—not only at the institution level but also in a wider context. Finally, multi-centric, cross-country research will help in determining the overarching and unique predictors of first inpatient admission in SUD.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s11469-021-00702-z.

Declarations

Conflict of Interest The authors declare no competing interests.

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