Predictors of Dropout From Inpatient Substance Use Treatment: A Prospective Cohort Study

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ABSTRACT

INTRODUCTION: Dropout from inpatient treatment for substance use disorder (SUD) is an ongoing challenge. The aim of this study was to identify demographic, substance use, and psychological factors that predict dropout from postdetoxification inpatient SUD treatment.

MATERIALS AND METHODS: A total of 454 patients from 5 inpatient SUD centers in Central Norway were consecutively included in this naturalistic, prospective cohort study.

RESULTS: A total of 132 patients (28%) did not complete the planned treatment stay (dropped out). Cox regression analysis showed that higher levels of intrinsic motivation for changing personal substance use reduced the dropout risk (adjusted hazard ratio [adjHR]: 0.62, 95% confidence interval [CI]: 0.48-0.79). Higher levels of mental distress were associated with an increased risk for dropout (adjHR: 1.48, 95% CI: 1.11-1.97).

CONCLUSIONS: The role of mental health and motivation in reducing dropout risk from inpatient SUD treatment should be targeted in future prospective intervention studies.

KEYWORDS: Drug treatment, substance use disorder, dropout, motivation, mental health

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Introduction

Although substance use disorder (SUD) treatment is mainly provided in outpatient settings, inpatient treatment constitutes about 80% of the resources consumed in Norwegian specialized treatment for SUD.[1] Patients in inpatient SUD treatment often have co-occurring social,[2] somatic,[3] and mental health problems.[4] Comprehensive inpatient treatment is directed toward patients' complex treatment needs. An ongoing challenge, however, is that a large proportion of patients fail to complete the planned treatment program (dropout).[5]

The reported prevalence of inpatient treatment dropout varies considerably between studies. The number of patients who drop out is typically much higher in long-term than in short-term inpatient programs. For instance, the dropout rates in Levin et al[6] and López-Goñi et al[7] long-term therapeutic community treatment approaches were 78% and 60%, respectively, whereas less than one-third of patients dropped out of short-term residential[8,9] and rehabilitation programs.[10] Even within treatment programs of similar temporal duration, the variation in the proportion of patients who drop out is substantial. For instance, within treatment modalities with contract durations up to 6 months, the reported dropout proportions varied from around 25% in residential treatment[11,12] to 66% in a modified therapeutic community treatment modality.[13] Some of these differences may be due to in-treatment factors, such as available personnel resources, therapeutic competence, and patient involvement.[8,9,14]

Previous research that attempted to identify patient-related factors associated with dropout from inpatient SUD treatment showed that a combination of demographic, substance use, and psychological variables could be important. Factors associated with dropout identified in previous studies were young age,[7,9,10] mental health problems,[12,15] psychiatric diagnoses,[6,15,16] and severity of drug use.[9] However, evidence is not clear-cut regarding the importance of these factors. For instance, several studies did not find age differences between those who dropped out and those who completed treatment.[11,12,13] Meier et al[17] did not find an association between psychological problems and treatment dropout, and several researchers did not find that

problem drug use influenced treatment dropout.[8,11,13] The inconsistent results on factors associated with treatment dropout show that there is a need for larger studies from diverse settings that include all of these variables.

Important factors in SUD treatment such as patient motivation[18,19] and psychiatric diagnoses[20] have to a small extent been investigated in relation to SUD treatment dropout.[5] The available research on the role of motivation in inpatient treatment has limited generalizability because it has been conducted within homogeneous patient groups, such as opiate users,[17] those in specific treatment facilities, such as Veterans Affairs treatment programs,[9] and in a small sample at a short-term unit.[8] Previous research regarding the relative role of psychiatric diagnoses for inpatient SUD treatment dropout also had methodological limitations, including self-reported diagnoses,[15]and delimited patient populations, such as focusing only on patients with attention-deficit hyperactivity disorder (ADHD)[6] and personality disorders.[16]

The main aim of this study was therefore to extend the current literature by identifying demographic, substance use, and psychological factors that predict dropout across different inpatient SUD treatment centers.

Method

Design

This was a naturalistic prospective multicenter cohort study of patients admitted to an inpatient stay at 5 specialized SUD treatment centers in 2 counties covering urban and semirural areas in Central Norway. The inclusion took place from September 2014 to May 2016, and the data collection continued until November 2016, when all the participants had been discharged.

The Regional Ethical Committee for Medical Research in Norway approved the study (application #2013/1733). The patients were provided both a thorough verbal and written description of the study, emphasizing voluntary participation, confidentiality and the opportunity to withdraw from the study at any time. The patients were not offered any response incentives. In accordance with the Declaration of Helsinki,[21] those who agreed to participate gave their signed consent for follow-up and for their medical records to be accessed to obtain information about demographic and clinical variables.

Setting

People with SUDs in Norway have treatment rights equivalent to the rights of those with other chronic diseases under Norway's public health system. The available treatment services include outpatient units, day care, and short- and long-term inpatient treatment. Inpatient treatment requires patients to be abstinent from drug and alcohol during the treatment stay. If necessary, patients undergo up to 14 days of detoxification immediately prior to intake. To be enrolled to inpatient treatment, the patients need a referral from social services, general practitioners, or the specialized health services.[22] The assessment for specialized SUD treatment is performed by an interdisciplinary assessment unit, representing social, psychological, and medical competence. They base their decision of priority regulation issued by the health authorities,[23] where the severity of substance use and cost-benefit of treatment, including the patient's previous treatment experiences are emphasized.

The Central Norway Regional Health Authority (RHA), which is 1 of 4 state-owned RHAs,[24] provides specialized public health services to the population of 3 counties with approximately 720 000 inhabitants. The 5 inpatient SUD treatment centers in this study represent the 5 largest SUD treatment centers in the region (out of 7 centers) and cover most of the interdisciplinary specialized treatment provided for the SUD population in Central Norway. When the study was initiated, the centers were co-organized at a hospital trust for SUD treatment and had established collaboration on research and development issues (including their participation in this study). Two regional clinics did not participate due to organizational and practical issues. One clinic was under construction and had only 6 treatment beds when the enrollment started. The other was a nonprofit organization with operating agreement with the local hospital, but without research collaboration. All treatment centers provide a combination of group and individual therapy, including milieu and cognitive behavioral therapies, as well as pharmacologic treatment. Three centers provided treatment up to 4 months (short-term) and 2 centers provided more than 6 months treatment stay (long-term). More detailed characteristics of the centers included in the study are shown in Table 1. One of the 5 centers had 2 units: 1 for adolescent/young adults and 1 for older patients (reported together in this study because patients were not identified at unit level).

Participants and recruitment

To mirror clinical reality, the only criterion for inclusion was admission. Patients were consecutively recruited by dedicated research assistants with no conflict of interest with the patients. The research assistants were also available to answer general questions from the participants. The treatment staff ascertained whether it was ethically responsible to request study participation. Patients who were judged physically or mentally incapable of giving consent (eg, patients with strong drug cravings and/or high levels of mental distress) were not approached. Recruitment was conducted the first 2 weeks the patients were enrolled at the inpatient unit.

Data collection and variables

Baseline data were collected using information from the electronic medical record and self-report data from a questionnaire completed at the beginning of inpatient treatment.

Table 1. Characteristics of the participating substance use disorder treatment centers.[a]

CENTER	TARGET GROUP	TREATMENT OFFERED	LENGTH OF STAY[b]	NO. OF BEDS	FTE YEARS[c]
1	Severe substance abuse and polysubstance abuse Substance use disorders Alcohol use disorders, mild polysubstance use Age >18 y	Assessment Individual therapy Group therapy Pharmacologic treatment	2 mo (extension possible)	26	31.4
2	Severe substance abuse and polysubstance abuse Substance use disorders Alcohol use disorders and mild polysubstance use Age >18 y	Assessment Individual therapy Group therapy Pharmacologic treatment	6-9 mo	18	29.0
3	Alcohol use disorders and mild polysubstance use Psychoactive substance use disorders Age >25 y	Assessment Individual therapy Group therapy Family therapy Pharmacologic treatment	3 mo	22	16.4
4	Severe substance abuse and polysubstance abuse Substance use disorders Co-occurring severe substance abuse and severe mental disorders Age 18-27 y	Assessment Individual therapy Group therapy Pharmacologic treatment Withdrawal	9-12 mo	22	31.0
5A	Severe substance abuse and polysubstance abuse Substance use disorders Alcohol use disorders and mild polysubstance use Co-occurring severe substance abuse and severe mental disorders Age >26 y	Assessment Individual therapy Group therapy Pharmacologic treatment Withdrawal	3 mo. (1 mo extension possible)	13	26.8
5B	Severe substance abuse and polysubstance abuse Substance use disorders Alcohol use disorders and mild polysubstance use Age 16-26 y	Assessment Individual therapy Group therapy Pharmacologic treatment Withdrawal	3 mo	17	30.8

Abbreviation: FTE, full-time equivalent.
[a]Center 5 has 2 units (5A and 5B).
[b]All centers adjust the length of stay for each individual patient.
[c]FTE years: the total hours worked equivalent to number of employees on a full-time basis.

Treatment dropout. Dropout from treatment was defined as patients who did not complete the planned inpatient program. Information about dropout status (yes/no) and reasons for dropout was collected from the medical records. The indicated reasons for dropout were reviewed and categorized by the research assistants in collaboration with the researchers.

Demographics. Information about sex, age, and educational level attainment was collected from the medical records. The age variable was categorized in groups with 10-year intervals to enable investigations of dropout risk among adolescents (<25 years), young adults (25-34 years), middle-aged (35-44 years), and older patients (>44 years).

Previous inpatient stay, drug use, and diagnoses. Information about previous SUD inpatient stay, drug use, International Classification of Diseases (ICD-10) SUD diagnoses (3-character categories [F10-19], indicating the substance used), and other psychiatric diagnoses made by a medical specialist or psychologist was obtained from the medical records. In general, the medical doctors and psychologists use ICD-10 criteria and diagnostic tools.[25] The recorded diagnosis either was made at a previous mental health or SUD treatment stay or was based on the clinicians' assessments during the current stay. The psychiatric diagnoses were categorized as mood disorders (F32, F33), anxiety disorders (F40, F41), posttraumatic stress disorders (PTSD, F43.1), personality disorders (F60), ADHD (F90), and other psychiatric diagnoses. The specified disorders, which represented the 5 most prevalent disorders comorbid to SUD, were included in further analyses.

Self-reported previous inpatient stay (yes/no) encompassed any previous inpatient stays in specialized SUD treatment.

Type of drug used most frequently the last 6 months before admission was categorized as alcohol, cannabis, amphetamines, opioids, nonprescribed benzodiazepines, and other drugs.

Polydrug use (yes/no), to having more than one SUD diagnosis, was constructed from information in the medical record about SUD diagnoses classified according to ICD-10 criteria.

A variable for injecting drug use (yes/no) was based on information in the medical record about whether the patient had ever injected a drug.

Self-reported psychological variables. Motivation was measured using the Norwegian version[26] of the motivation subscale of the Circumstances, Motivation, Readiness, and Suitability instrument.[27] The motivation subscale includes 5 items measured on a 5-point Likert scale ranging from 1 (completely disagree) to 5 (totally agree). High scores indicate increased intrinsic motivation. The average score was used and the internal consistency of the scale was found to be satisfactory (Cronbach $\alpha = 0.81$, average-corrected interitem total correlation = 0.61).

Symptoms of general mental distress were measured using the Norwegian 10-item version[28] of the Hopkins Symptom Checklist (HSCL).[29] The 10 items were rated on a 4-point Likert scale from 1 (not at all) to 4 (extremely). The average score was used and higher scores indicate more mental distress. In the current sample, the HSCL-10 had a Cronbach α of 0.88 and an average-corrected interitem total correlation of 0.62.

Sample size

There was no formal a priori sample size calculation because the aim was to include all patients admitted to the centers in a 2-year period.

Statistical procedures

All statistical procedures were performed with IBM SPSS Statistics (version 23; IBM SPSS, Armonk, NY, USA). Descriptive statistics were used to describe the demographic and psychological characteristics of the sample. For the bivariable analysis, comparing those who dropped out with those who completed their treatment, the Pearson χ^2 analysis was used for categorical variables with more than 2 categories, whereas proportion tests and independent samples *t* tests were conducted as appropriate to examine specific pairwise differences in categorical and continuous variables, respectively.

Cohen *d* and Cramer *V* values were calculated to yield effect sizes for continuous indexes and categorical variables, respectively, with 0.20 to 0.49 representing a small effect, 0.50 to 0.79 a moderate effect, and 0.80 and over a strong effect.[30]

The variables that were significantly associated with treatment dropout in bivariable analyses ($P < .05$) were included as predictors in a proportional hazard (Cox) regression model. Cox regression was chosen due to its ability to adjust for variation in the exposure time period for treatment dropout across inpatient programs with varying temporal duration.

In the analysis, each patient's time in treatment was used as the outcome variable and dropout was used as the status of event variable (yes/no). Time at risk was estimated from the day the patient was admitted to the residential apartment until the patient either dropped out of treatment or completed the treatment program. We estimated both the unique univariable associations between each individual predictor (ie, crude hazard ratios) and the multivariable associations between the predictors and time to dropout (ie, adjusted hazard ratio [adjHR]). The adjHR indicates the relative risk of treatment dropout when all remaining factors in the model are adjusted for and is interpreted in a similar manner to the adjusted odds ratio in logistic regression. To investigate whether dropout differed systematically across the treatment centers, 2 additional Cox regression analyses were conducted. The first included the treatment center variable as a dichotomous indicator (short-term/long-term treatment stays). In the second analysis, each of the 5 centers was included as separate dichotomous variables.

Results

Participants

Of the 551 patients eligible for participation, 79 refused to participate and 2 patients were not approached because of poor mental health functioning. Five patients withdrew their consent from the study after inclusion. The final sample comprised 464 patients (participation rate = 84%).

The sample consisted of 27% women, a majority (36%) was 44 years of age or more (M = 39.0, SD = 13.4), and 12% had a higher education (Table 2). Substances used most frequently in the past 6 months included alcohol (47%), cannabis (18%), amphetamines (17%), opioids (9%), nonprescribed benzodiazepines (7%), and other drugs (cocaine, GHB [γ-hydroxybutyrate], ecstasy) (2%) (Table 2). About 50% were polydrug users, and 39% reported that they had ever injected a drug. A total of 95% of patients had one or more registered SUD diagnoses according to the ICD-10 system (F10-19) (World Health Organization [WHO], 1992) in their medical records (Table 2). The remaining 5% had a diagnosis in the category Z00 to Z99 (factors influencing health status and contact with health services). About 47% of the patients had at least one additional psychiatric ICD-10 diagnosis (F20-F99).

Prevalence of dropout

A total of 132 patients (28%) had dropped out of treatment. At the long-term treatment centers (centers 2 and 4) (see Table 1), the proportion of patients who dropped out was 42% (N = 20) and 76% (N = 16), respectively. The number of patient who dropped out was lower at the centers with shorter contract durations, with dropout rates of 18% at center 1 (N = 27) and

Table 2. Sample characteristics and bivariable analysis comparing dropout patients with those who completed treatment (N = 464).

VARIABLE	TOTAL (N = 464)	TREATMENT DROPOUT		*P* VALUE	EFFECT SIZE[a]	MEAN DIFFERENCE (95% CI)
		YES (N = 132)	NO (N = 332)			
CATEGORICAL	N	NO. (%)	NO. (%)			
Gender						
Female	126	40 (30)	86 (26)	.322	0.04	
Male	336	91 (70)	245 (74)			
Missing data	2	1	1			
Age, y				**.001**		
<25	78	33 (25)	45 (14)	.002	0.14	
25-34	125	41 (31)	84 (25)	.207	0.06	
35-44	94	29 (22)	65 (20)	.561	0.03	
>44	167	29 (22)	138 (42)	.001	0.18	
Education				**.001**		
Primary	146	59 (47)	87 (27)	.001	0.19	
Middle level	247	56 (44)	191 (60)	.003	0.14	
High	54	12 (9)	42 (13)	.282	0.05	
Missing data	17	5	12			
Primary drug						
Alcohol	219	51 (39)	168 (51)	**.020**	0.11	
Cannabis	83	27 (21)	56 (11)	.347	0.04	
Amphetamines	77	22 (17)	55 (17)	.958	0.00	
Opioids	40	16 (12)	24 (7)	.086	0.08	
Nonprescribed benzodiazepines	31	10 (8)	21 (6)	.615	0.02	
Other drugs[b]	9	4 (3)	5 (2)	.278	0.05	
Missing data	5	2	3			
Ever injected						
Yes	180	65 (49)	115 (35	**.004**	0.14	
No	284	67 (51)	217 (65)			
Polydrug use						
Yes	220	76 (58)	144 (43)	**.005**	0.13	
No	244	56 (42)	188 (57)			
SUD diagnosis						
Yes	442	122 (92)	320 (96)	.089	0.08	
No	22	10 (8)	12 (4)			
Mood disorder						
Yes	52	11 (8)	41 (12)	.214	−0.06	
No	412	121 (92)	291 (88)			

(Continued)

Table 2. (Continued)

VARIABLE	TOTAL (N = 464)	TREATMENT DROPOUT				*P* VALUE	EFFECT SIZE[a]	MEAN DIFFERENCE (95% CI)
		YES (N = 132)		NO (N = 332)				
CATEGORICAL	N	NO. (%)		NO. (%)				
Anxiety disorder								
Yes	42	11 (8)		31 (9)		.727	−0.02	
No	422	121 (92)		301 (91)				
PTSD								
Yes	35	16 (12)		19 (6)		**.018**	0.11	
No	429	116 (88)		313 (94)				
Personality disorder								
Yes	38	13 (10)		25 (8)		.412	0.04	
No	426	119 (90)		307 (92)				
ADHD								
Yes	51	26 (20)		25 (8)		**.001**	0.18	
No	413	106 (80)		307 (93)				
Previous inpatient treatment								
Yes	284	85 (64)		199 (61)		.373	0.04	
No	176	47 (36)		129 (39)				
Missing data	4	0		4				
Continuous[c]		N	Mean (SD)	N	Mean (SD)			
Mental distress	463	132	2.27 (0.69)	331	2.11 (0.69)	**.027**	0.23	−0.16 (−0.30 to −0.02)
Motivation	463	132	4.11 (0.80)	331	4.32 (0.70)	**.006**	−0.28	0.21 (0.06 to 0.36)

Abbreviations: ADHD, attention-deficit hyperactivity disorder; CI, confidence interval; PTSD, posttraumatic stress disorders; SUD, substance use disorder.
χ^2 test for overall differences in categorical variables exceeding 2 categories. Pairwise differences calculated with proportion tests and independent samples *t* tests as appropriate for categorical and continuous variables.
Bold values indicate significant differences.
[a]Effect size calculated with Cramer *V* and Cohen *d*. Negative numbers reflect retention (less dropout).
[b]Included cocaine, GHB (γ-hydroxybutyrate), ecstasy.
[c]Higher scores reflect greater mental distress (range: 1-4) and greater intrinsic motivation (range: 1-5).

center 3 (N = 14) and 34% at center 5 (N = 55). The proportion of dropouts was higher at long-term (51%, N = 36) than at short-term (24%, N = 96) treatment centers ($V = 0.22$, $P < .001$). The mean time in treatment, calculated from the date of admission to the date of discharge from the inpatient center, was 88 days (SD = 51) for patients who completed the program and 59 days (SD = 46) for those who dropped out (mean difference: 29 days, 95% confidence interval [CI]: 18-39, $P < .001$).

Reasons for dropout

Reasons for dropout were categorized into 2 main groups: patients' decision to end treatment was unilateral and not recommended by a therapist (N = 72), or the patient was prematurely discharged from the inpatient program in agreement with their therapists (N = 60) because of noncompliance (eg, drug use/urine drug testing by indication), and/or not being able to use the current treatment program. A comparison of the 2 dropout groups revealed no significant differences in demographic characteristics, clinical variables, or length of treatment stay. The patients who did not complete the planned treatment stay were therefore collapsed into a single dropout group for subsequent analyses, as has been done in previous studies.[12]

Bivariable comparisons between those who completed and those who dropped out

The bivariable analysis (Table 2) showed that the factors most strongly associated with dropout were psychological factors. The most influential factor was higher motivation ($d = -0.28$),

Table 3. Demographic and psychological predictors of dropout from inpatient treatment (N = 421).

VARIABLE	CRUDE HR	ADJHR	95% CI FOR ADJHR	*P* VALUE FOR ADJHR
Education				
Primary (ref.)	—	—	—	—
Middle level	0.60	0.70	0.47-1.04	.080
High	0.67	0.92	0.45-1.87	.818
Age, y				
<25 (ref.)	—	—	—	—
25-34	0.94	0.86	0.53-1.40	.544
35-44	0.89	1.13	0.63-2.00	.685
>44	0.65	0.98	0.51-1.87	.950
Alcohol as primary drug	0.91	1.44	0.92-2.26	.110
Polydrug use (yes)	1.41	1.25	0.82-1.91	.306
Ever injected drugs (yes)	1.40	1.52	0.99-2.32	.055
ADHD (yes)	1.65	1.52	0.96-2.40	.073
PTSD (yes)	1.54	1.33	0.77-2.29	.309
Motivation	0.70	0.62	0.48-0.79	.000
Mental distress	1.35	1.48	1.11-1.97	.008

Abbreviations: ADHD, attention-deficit hyperactivity disorder; adjHR, adjusted hazard ratio; CI, confidence interval; PTSD, posttraumatic stress disorders.

which was associated with lower dropout rates (retention). Higher dropout rates were associated most strongly with more mental distress ($d = 0.23$), ADHD diagnosis ($V = 0.18$), and ever injected drugs ($V = 0.14$). Patients who dropped out from treatment were substantially more likely to be younger than 25 years ($V = 0.14$), whereas the patients who completed treatment were more likely to belong to the group aged 44 years or more ($V = 0.18$). In terms of the highest educational attainment, the patients who dropped out were also more likely to have primary education ($V = 0.19$), whereas those who completed their stay were more likely to have completed a middle level ($V = 0.14$) or higher education ($V = 0.05$). Those in the dropout group were more likely to be polydrug users ($V = 0.13$) and less likely to use alcohol as their main drug ($V = 0.11$), compared with those who completed treatment.

Predictors of dropout

The variables that were significant at the $P < .05$ level in the bivariable analyses were included in a multivariable Cox regression analysis. The model was found to be significant (−2 log likelihood = 1292.28, $\chi^2 = 34.82$, $df = 12$, $P = .001$). Compared with the bivariable analysis which found 9 significant variables (displayed as "Crude HR" in Table 3), the multivariable analysis found only 2 variables that were significant at the $P < .05$ level. High intrinsic motivation was related to a reduced risk of dropout from inpatient treatment (adjHR: 0.62, 95% CI: 0.48-0.79). The most important risk factor of dropout from inpatient SUD treatment was high mental distress (adjHR: 1.48, 95% CI: 1.11-1.97).

There was a tendency for patients with ADHD diagnosis (adjHR: 1.52, 95% CI: 0.96-2.40), and for patients who had ever injected drugs (adjHR: 1.52, 95% CI: 0.99-2.32), to be at increased risk for treatment dropout.

The 2 additional Cox regression analyses did not show any substantial differences from the final model reported in Table 3. Only minor changes in the 95% CIs were observed when the treatment center variable was included in the models.

Discussion

This study showed that approximately one-quarter of patients dropped out of inpatient SUD treatment. The most substantial predictor of increased dropout risk was higher mental distress, whereas higher intrinsic motivation was associated with a reduced risk for dropout. There was also a tendency for patients with ADHD diagnosis and patients who had ever injected drugs to be at increased risk for treatment dropout.

The observed 28% prevalence of dropout is similar to the 21% and 25% rates reported by 2 studies conducted in the United States.[11,12] However, the prevalence is substantially lower than the dropout rate reported by others, who found about 50%,[17] 66%,[13] and 88% of patients[15] did not complete

treatment. Despite being at the lower end, a 28% dropout rate is still a sizable proportion of those admitted, emphasizing the need for measures to reduce dropout.

High motivation at the beginning of inpatient treatment was found to be associated with a reduced dropout risk, with those scoring one point higher on the motivation scale being 38% less likely to dropout. Previous research conducted in SUD inpatient treatment did not find an association between motivation and dropout.[8,9,17] Inconsistent results may be due to differences in how motivation was measured and in the type of treatment setting. Similar to previous results,[19,31] our findings suggest that the patients' own drive for amending their substance use before the treatment was initiated was important for retention throughout the program. This emphasizes the importance of further investigating the role of pretreatment motivational activities for patients who are referred to inpatient SUD treatment. One question is whether treatment preparation interventions during outpatient consultations could be used with effect before inpatient SUD treatment. Such interventions could be based on approaches with documented effects on intrinsic motivation, such as motivational interviewing.[32] Pretreatment educational interventions that have shown promising results in terms of increased patient motivation and involvement in community mental health settings[33] may also hold promise in preparing SUD patients for inpatient treatment. Initial motivation to change substance use behavior may be affected by both internal and external factors during the course of treatment,[34] thus continuous therapeutic support and encouragement to maintain or increase patients' motivation may affect treatment outcome.

The most prominent risk factor for dropout from inpatient SUD treatment in this study was higher mental distress; there was a 48% increased risk of not completing treatment for those with 1 point higher score on the Norwegian 10-item version of the HSCL.[28] This finding aligns with previous research[12] and supports the assumption that patients who experience high levels of psychological symptom load may have issues in adapting to the inpatient treatment setting.[15,35] It could also be that the treatment centers are insufficiently attentive to the psychological needs of these patients. Mental distress presented at intake to treatment may to some extent be due to the physiological effects of drugs.[36] However, previous research studies that have measured mental distress among SUD patients at admission and discharge suggest that clinically significant symptoms of anxiety and depression are still present at the end of the stay.[37] Addressing symptom load among patients with SUD has been found to improve substance use outcomes.[38] Thus, taken together with the finding that mental distress predicts dropout, this indicates that it is worthwhile to investigate whether increased focus on treating mental health disorders can improve outcomes in SUD inpatient treatment.

Several of the variables included in our final model were not significant predictors of treatment dropout. There was a tendency for patients with a concurrent ADHD diagnosis to have an elevated risk of dropout from inpatient SUD treatment ($P = .073$). This finding is consistent with previous studies that have suggested that ADHD symptoms, such as inattention, poor impulse control, and exaggerated arousal level,[39,40] may influence patients' ability to take part in inpatient treatment settings.[6] A recent literature review suggested that patients with ADHD may benefit from physical exercise as part of the treatment program,[41] and it may be prudent to investigate this in inpatient SUD treatment. The other psychiatric diagnoses included in our analyses (mood disorder, anxiety disorder, PTSD, personality disorder) did not predict dropout. Based on the current findings, and previous research,[12] it may be argued that while general mental distress seems to be an important predictor, specific psychiatric diagnoses are relatively less important as predictors of dropout from inpatient treatment

There was also a tendency for patients who had ever injected drugs to be at increased risk for dropout. This finding is consistent with previous results suggesting that severity of drug use increases the risk for dropout from inpatient SUD treatment.[9] However, other studies conducted within inpatient treatment settings have not revealed associations between drug use pattern and treatment dropout.[8,13] Inconsistent findings between studies may be due to the use of different measures to indicate the severity of substance dependence and variations in the independent variables included in analyses.

Young age has been found to predict treatment dropout in some,[9,10] but not all previous studies conducted among inpatients.[8,17] Again, discrepant findings may be due to methodological differences (ie, study populations, settings, number and types of other variables included).

The major strengths of this study were the prospective design, the relatively large sample size, the inclusion of several centers, and the use of information in medical records about dropout, demographic, and clinical characteristics, and psychiatric diagnoses. The high participation rate makes major selection biases unlikely. The study is limited by the available variables and does not include detailed information on previous SUD treatment history, polydrug use, and severity of dependence. However, because the study included most of the variables identified in previous research, it is unlikely that any major confounding variables have been excluded. A possible avenue for further research is to conduct qualitative semistructured interviews to further explore what the variables predicting dropout mean to the patients. The use of medical records may represent a weakness because the information provided may not be accurate,[42] and some relevant information might not have been recorded (information bias). It is also a limitation that information about factors that affected the initial treatment plan is not extracted. Ideally, this information could have been quality assured and supplemented with in-depth information about the patients' perspectives on the dropout process. Another limitation is that this study did not collect

data on whether patient perceived benefit of treatment affects the decision to leave or retain in treatment.

Conclusions

Our study, with its prospective design and the large sample from publicly financed inpatient SUD treatment programs, had a stronger methodology than most previous studies on predictors of inpatient SUD treatment dropout. Therefore, our findings expand the current knowledge on treatment dropout. The present results suggest that the role of mental health and intrinsic motivation should be further investigated to determine their potential for lowering SUD treatment dropout. These factors can then be targeted in future prospective intervention studies.

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Author Contributions

HWA designed the study, wrote the protocol, and drafted the manuscript. EW and EO made substantial contributions to the conception of the study. TN undertook the statistical analyses and drafted the manuscript. AS contributed to the planning of the study and the design of the statistical analysis. All authors contributed to the revision of the manuscript and have approved its final version.

Disclosures and Ethics

As a requirement of publication, authors have provided to the publisher signed confirmation of compliance with legal and ethical obligations including but not limited to the following: authorship and contributorship, conflicts of interest, privacy and confidentiality, and (where applicable) protection of human and animal research subjects. The authors have read and confirmed their agreement with the ICMJE authorship and conflict of interest criteria. The authors have also confirmed that this article is unique and not under consideration or published in any other publication, and that they have permission from rights holders to reproduce any copyrighted material The external blind peer reviewers report no conflicts of interest.

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