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ORIGINAL ARTICLE

Readmission and Dropout in Outpatient Centers: An Analysis of Real-World Data in Patients with Dual-Diagnosis

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Abstract

Substance use disorder treatment faces challenges such as dropout, relapse, and readmission. This study aims to identify factors associated with readmission and those influencing dropout among dual diagnosis (DD) patients (those with both a substance use disorder and another psychiatric disorder) attending outpatient addiction centers. Retrospective cohort study using the electronic health records of 8383 outpatients diagnosed with DD. Bivariate analysis and regression analysis were applied to control for the variables. Age, incarceration for 30 days prior to admission, and specific patterns of consumption increased the likelihood of readmission. Specifically, individuals who reported no substance use in the 30 days before admission or those diagnosed with an opioid or cocaine use disorder were particularly susceptible to readmission. Of the dual diagnoses, patients with personality disorders were more likely to be readmitted. In relation to dropout, opioid dependence and frequency of use were associated with a higher probability of dropout. Patients with poorer adherence to treatment and previous readmissions were also more likely to drop out. Enhancing treatment adherence and reducing dropout and readmission rates poses a challenge in managing patients with DD. Leveraging electronic health records offers enhanced ecological validity concerning the outpatient treatment requirements for such patients. Therapeutic adherence, alongside specific sociodemographic variables and consumption patterns, emerges as pivotal factors in this context. Identifying and understanding these variables facilitates the customization of outpatient treatment strategies to better meet the needs of patients with comorbidities.

Keywords Dual Diagnosis · Readmission · Dropout · Substance Use Disorder · Real-World Data · Therapeutic Outcomes

Dropout (Krawczyk et al., 2017), relapse to drug use (Ambrosio-Flores & Alguacil-Merino, 2023), and readmission to treatment (Lorine et al., 2015; Ramadan et al., 2022)

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present challenges for managing substance use disorders (SUDs). In epidemiology, "*dropout*" and "*relapse*" are related terms with different clinical connotations. Dropout refers to abandoning the treatment being undertaken (Melville et al., 2010), while relapse can be defined as returning to drug use after a period of abstinence (Department of Health, 2004). Readmission involves the initiation of a new treatment. Patients who are readmitted to treatment may do so after a period of successful treatment or after abandoning previous treatment, with the latter being more common (Dacosta-Sánchez et al., 2023). In either case, these patients perceive a clinical deterioration resulting from their addiction, which prompts them to seek additional professional support beyond what they received after their initial treatment. According to a systematic review conducted by Brorson et al. (2013), outpatient addiction treatment centers were found to have dropout rates ranging from 23 to 50%. It has been noted that these dropout rates tend to increase among patients with both a mental health disorder and a substance use disorder, commonly referred to as dual diagnosis (DD) or dual pathology. A reported prevalence of 60% in the first month (Pennay et al., 2011) and 80% in the first year of treatment (Dixon et al., 2016) has been documented. Reports from the European Monitoring Center for Drugs and Drug Addiction (EMCDDA, 2023) and the Substance Abuse and Mental Health Services Administration (SAMHSA, 2022) have shown that more than 50% of treatment admissions are for patients who have received previous treatment. As a consequence of patient dropout, relapse, and readmission to treatment, administrative, legal, and healthcare costs increase. Furthermore, they have the potential to significantly impact the quality of life for those affected (Blackwood et al., 2021; Wade et al., 2006).

Extensive research has been conducted on several variables that may affect the likelihood of readmission (Durbin et al., 2007). However, the findings show a lack of consistency in their influence. While some studies suggest certain variables can lower the probability of readmission, others indicate an increase. Additionally, other variables are suggested to have no significant influence on future readmission. For example, concerning sociodemographic variables, among the variables that produce inconclusive results are age (Becker & Shafer, 2007; Geniş et al., 2020; Kim et al., 2011; Smith et al., 2015) and gender (Hutchison et al., 2019; McHugh et al., 2018; Smith et al., 2015). Nevertheless, readmission rates tend to be higher for individuals residing in urban areas (Ghosh et al., 2022; Hutchison et al., 2019) and those with physical disabilities or medical conditions (Šprah et al., 2017). Other factors that influence the likelihood of readmission include the individual's employment status (Böckmann et al., 2019; Callaghan & Cunningham, 2002; Donisi et al., 2016; Ramadan et al., 2022). In this context, it can be observed that individuals who are retired or unemployed are more likely to be readmitted. Furthermore, the variable "marital status" has been observed to impact the probability of readmission. Single patients tend to experience a higher rate of readmission than those who are in a couple or married (Böckmann et al., 2019; Callaghan & Cunningham, 2002; Donisi et al., 2016). Another variable that appears to affect this probability is the individual's living situation (Donisi et al., 2016), particularly whether they reside alone or with others. Regarding treatment, some authors have revealed that discharge status significantly affects the likelihood of readmission in the future (Dacosta-Sánchez et al., 2024; Ghosh et al., 2022). According to this framework, the probability of readmission is higher for patients who have discontinued treatment and who have not been discharged by a healthcare professional. As suggested by Greenfield and Wolf-Branigin (2009), patients who prematurely terminated treatment were more susceptible to requiring further therapy, possibly explaining this association.

In terms of mental disorders, the presence of comorbid mental disorders (Ghosh et al., 2022; Hutchison et al., 2019) and previous psychiatric hospitalizations (Donisi et al.,

2016) have been the most consistent predictor variables in this field. No agreement exists on which comorbid disorder has the most significant impact on readmission. However, according to the review by Donisi et al. (2016), the diagnoses that impact readmission are psychotic disorders, mood disorders, and personality disorders. Previous research has also indicated that the presence of impulse control disorders influences the likelihood of readmission (Smith et al., 2015). Nevertheless, an appropriate intervention model addressing SUD and other psychiatric comorbidities can promote the recovery of these patients and yield outcomes comparable to those of patients without comorbidities (Fantuzzi & Mezzina, 2020; Newton-Howes et al., 2017; Watkins et al., 2022).

The lack of conclusive results on the factors associated with patient readmission during treatment may be explained by the heterogeneity of the samples across studies. Understanding the context in which patients undergo treatment is crucial to identifying factors associated with unsatisfactory treatment outcomes. The specialized literature on readmissions focuses primarily on rehospitalization in psychiatric or inpatient facilities, as evidenced by the review by Donisi et al. (2016) and recent research (e.g., Genis et al., 2020; Ghosh et al., 2022; Ramadan et al., 2022; Soler et al., 2021), with minimal attention given to outpatient addiction treatment. Inpatient treatment is a structured 24-h care program focused on recovery activities. Residential and inpatient treatment aims to stabilize patient recovery before patients become involved in outpatient settings and transition to an unsupervised environment. Outpatient facilities provide addiction treatment that is compatible with carrying out their daily activities. However, this comes at the cost of not having daily therapeutic supervision, which could be detrimental to their recovery process (National Institute on Drug Abuse [NIDA], 2018; Reif et al., 2014). Monitoring outpatient facilities, unlike inpatient facilities, is crucial because patients are responsible for maintaining their treatment, unlike inpatient facilities. In this context, previous studies have predominantly examined samples from individuals with either SUD or mental disorders, while studies involving individuals with dual diagnoses are scarce (Botha et al., 2018; Delayahu et al., 2014; Ghosh et al., 2022; Greenfield & Wolf-Branigin, 2009; Hutchison et al., 2019; Ramadan et al., 2022; Rømer Thomsen et al., 2018). For instance, Rømer Thomsen et al. (2018) conducted a study in a mental health unit with patients who had psychiatric comorbidities (schizophrenia and SUD) and found that comorbid diagnoses and psychiatric history were significant predictors of readmission. Additionally, they identified cannabis or amphetamine use as a strong predictor. However, it is important to note that this study was conducted within mental health units rather than outpatient centers.

On the other hand, sample sizes in clinical research are relatively limited due to the complexity of involving numerous patients (e.g., Gryczynski et al., 2021). Consequently, it is difficult to detect potential confounding variables, making the generalizability of the results questionable. This justifies the need for further investigations with larger samples to help identify possible factors for an undesirable prognosis in patients with DD in outpatient centers.

In the last decade, research with real-world data (RWD) has become an area of growing interest (Makady et al., 2017) as a complement to the usual observational studies and clinical trials in the field. One form of RWD is electronic health records (EHR), which consist of a set of health-related data (medical history, diagnoses, and information on substance consumption) on patients or the health services they receive (Arlett et al., 2022; Liao et al., 2023). These data provide access to large amounts of data collected in clinical scenarios. These records improve the ecological validity of the analyzed information and allow for the statistical control of relevant variables that affect treatment response (Corrigan-Curay et al., 2018; Koch et al., 2024; Marsch et al., 2020). In this context, cohort studies emerge

as an appropriate methodology (Levin, 2006) for employing EHR data, given the necessity of large sample sizes to facilitate a comprehensive understanding and analysis of the resulting outcomes.

The current study utilized the EHR of patients with dual pathology to achieve two objectives: 1) identify sociodemographic variables, consumption patterns, and mental disorder diagnoses associated with readmission to treatment and 2) determine which variables, prior to and associated with the therapeutic process, are related to treatment dropout versus those who achieve therapeutic goals.

Materials and Methods

Design

Retrospective cohort study.

Participants

Outpatients admitted between January 1, 2015 and September 1, 2020 to specialized addiction services. Inclusion criteria were (1) having a diagnosis of an addictive disorder and another mental disorder according to the International Classification of Diseases 10 (ICD-10), and (2) attending a minimum of three appointments at their treatment centers.

The study included 8383 patients who received treatment in one of the 121 outpatient drug abuse centers in the public network of Andalusia (a region of Spain with a population of more than 8,000,000 inhabitants). The majority of patients were male (79.6%) and had a mean age of 40.41 years (SD = 10.83). Most participants had completed primary (37.6%) or secondary (23.4%) education. In terms of employment status, 49.3% were unemployed, 19.5% were retired, 23.5% were employed, and 2.5% were studying. Concerning drug use, it is possible for patients to have multiple dependence disorders. Consequently, in the total sample, 64% of the patients were diagnosed with alcohol use disorder, 42.5% with cocaine use disorder, 36.1% with cannabis use disorder, and 21.8% with opioid use disorder. Among them, 2674 (31.9%) received coordinated care with mental health services. Out of all participants, 70.3% were readmitted to treatment (25.3% of those readmitted were for a different drug than the previous admission). These patients had not received treatment for at least six months, which aligns with the average duration recommended and used by most of the literature (Fischer et al., 2014; Rumball-Smith & Hider, 2009).

Procedure

The EHRs of the patients were used. The EHR included sociodemographic variables, drug use history, therapeutic adherence, and previous treatments. The variables are collected according to the EMCDDA protocol (EMCDDA, 2012). This protocol, known as the Treatment Demand Indicator (TDI) standard protocol 2.0, specifies a minimum set of items for national monitoring systems to record and report, ensuring data comparability across countries. The EHR is designed to avoid significant loss of information and to identify inaccuracies and inconsistencies in the responses during the review process.

Patients can also receive mental health treatment in a coordinated manner in mental health services.

Ethics and Approvals

The study received ethical approval from the Research Ethics Committee of the Ministry of Health in Andalusia, ensuring that it met the ethical standards for data management.

The storage and coding of the data adhered to the General Health Law of April 25, 1986 (Spain) and Law 41/2002 of November 14, which regulate the autonomy, rights, and obligations of patients regarding clinical information and documentation. Additionally, compliance with the Organic Law 3/2018 of December 5, 2018, governing the safeguarding of personal data and digital rights, adapted to European regulations, has been guaranteed.

The ethics protocol code for this study's project funding is "0661-N-22."

Measures

Sociodemographic variables, along with those related to consumption patterns and psychiatric comorbidities, were recorded at the beginning of treatment. Process variables were collected between the start and the end of treatment. Outcomes were recorded once the patient had completed treatment. These variables were coded as follows:

a) Dropout was defined as a binary variable, where 1 represented dropout, and 0 represented patients who have completed therapy and were discharged.
b) Readmission was defined as a patient re-entering treatment 6 months after discharge or dropping out. The variable is binary, with 0 indicating no readmission and 1 indicating at least one readmission.

Statistical Analysis

Initially, patients who did and did not experience readmission to treatment were compared. Differences between nominal and ordinal variables were analyzed using Pearson's chi-square test, and phi or Cramer's V statistic was used to calculate effect sizes (Cohen, 1988). The Mann−Whitney U test was used to analyze continuous variables, and Hedges' g was used to determine the effect size, as this statistic considers different sample sizes (Hedges, 1981). Due to the large sample size, even minor differences between groups can result in statistically significant differences. Therefore, consideration was given to both the statistical significance and effect size. To enhance the statistical control between variables, multivariate analysis was used. This analysis included all covariates, even those that did not show statistical significance in the bivariate analysis, as they might still hold predictive value when included in the multivariate analysis. This comprehensive approach ensures that no potentially relevant information is overlooked.

To achieve the second objective, contingency tables were created to compare patients who received therapeutic discharge with patients who discontinued treatment. This analysis excluded patients who were in treatment, had died during treatment, or had been referred to other health resources. The same statistics were used. Finally, the study conducted a multivariate analysis to determine the variables associated with treatment abandonment using the same criteria.

All analyses were conducted using IBM SPSS Statistics software, version 29.0.1.0 (Chicago, IL, USA).

Results

Differences Between Patients with and Without Readmission to Treatment and Prediction of Readmitted Patient

Table 1 presents the sociodemographic features, substance use patterns, and psychiatric comorbidities of the patients. The data indicate a significantly higher percentage of women without readmission than of men but with a small effect size (24.9% vs. 18.5%; $p < 0.001$; $\Phi = -0.073$). Significant differences and effect sizes greater than 0.1 were found in employment status between the two groups ($p < 0.001$; $V = 0.174$). A higher proportion of patients who were readmitted were either unemployed or retired. Conversely, a greater number of patients who were admitted only once were employed. Most patients in both groups cohabited with their families within 30 days before admission. It is significant to highlight that a percentage of patients who were readmitted were in prison during the 30 previous days to the onset of treatment (2.3% vs. 8.7%). A pronounced difference in the leading source of referral to treatment was found ($p < 0.001$; $V = 0.373$). Almost 65% of the readmitted patients came by their initiative. Most patients who were not readmitted were referred for treatment by health services. However, 28.5% sought treatment on their initiative. Opiate (12.4% vs. 25.8%; $p < 0.001$; $\Phi = 0.148$) and cocaine (37.90% vs. 44.1%; $p < 0.001$; $\Phi = 0.060$) use disorders were more prevalent among patients who were readmitted to treatment. Moreover, a higher percentage of individuals with polysubstance dependence were readmitted. Patients with a single admission exhibited superior daily use of drugs (55.4% vs. 38.0%) compared with those who were readmitted. Additionally, patients readmitted were more likely to have not consumed in the last 30 days (12.1% vs. 24.6%). Notably, individuals who were readmitted started using their primary drug at a younger age.

Regarding comorbid disorders, anxiety disorders were more prevalent among patients who had a single admission to treatment (35.1% vs. 29.0%). However, among the readmitted patients, personality disorders (19.3% vs. 29.6%; $p < 0.001$; $\Phi = 0.107$), specifically Cluster B, were significantly more prevalent.

Table 2 presents the results of the multivariate analysis. The fit indicators demonstrated adequate values, with a concordance percentage of 77.9% and a concordance index (C) of 0.778.

The regression analysis indicated that older individuals were more likely to be readmitted (OR = 1.019; 95% CI: 1.012 – 1.025). Additionally, being male increased the likelihood of readmission (OR = 1.255; 95% CI: 1.088 – 1.448). It was found that individuals with jobs were less likely to be readmitted (OR = 0.579; 95% CI: 0.505 – 0.664) than those unemployed. Patients living with their families of origin, in prison (OR = 3.435; 95% CI: 2.414 – 4.887), or in other residential institutions (OR = 2.537; 95% CI: 1.603 – 4.015) were found to be more likely to experience readmission than those living alone. It has been observed that the patients referred by medical, legal, or social services were less likely to be readmitted than those who sought treatment on their own initiative. Regarding consumption patterns, patients diagnosed with opiate dependence (OR = 1.706; 95% CI: 1.424 – 2.045) or polydrug dependence (OR = 1.550; 95% CI: 1.369 – 1.755) were found to be more likely to be readmitted. Additionally, patients who abstained from substance use in

Table 1 Bivariate analysis of Sociodemographic Characteristics, Consumption Patterns, and Psychiatric Comorbidity of dual disorder patients by readmission

	Readmission to treatment		*p*	Effect size
	No (n = 2490)	Yes (n = 5893)		
Sociodemographic Variables				
Admission Age (M (SD))	40.60 (12.25)	41.13 (10.28)	.186	g = .049
Gender (n (%))				
Men	1870 (75.1)	4804 (81.5)	< .001	Φ = -.073
Women	620 (24.9)	1089 (18.5)		
Level of education (n (%))				
No Studies or primary	1377 (56.8)	3240 (55.9)	.001	V = .041
Secondary	510 (21.0)	1414 (24.4)		
Higher	538 (22.2)	11,241 (19.7)		
Employment Status (n (%))				
Employed	835 (35.1)	1119 (20.3)	< .001	V = .174
Unemployed	1055 (44.4)	3037 (55.2)		
Retired	495 (16.4)	1230 (22.4)		
Student	97 (4.1)	113 (2.1)		
Cohabitation status 30 days prior (n (%))				
Living alone	416 (17.4)	727 (13.5)	< .001	V = .147
Living alone with children	116 (4.9)	170 (3.1)		
With partner	285 (11.9)	457 (8.5)		
Family	1452 (60.9)	3337 (61.8)		
Friends	31 (1.3)	105 (1.9)		
Prison institutions	54 (2.3)	470 (8.7)		
Residential institutions	32 (1.3)	136 (2.5)		
Main Referral Source (n (%))				
Legal Services	90 (3.8)	257 (4.6)	< .001	V = .373
Own initiative	680 (28.5)	3614 (64.4)		
Family members	483 (20.3)	584 (10.4)		
Health services	722 (30.3)	455 (8.1)		
Social Services	407 (17.1)	703 (12.5)		
Consumption Variables				
Substance Use Disorder according to ICD-10 (n (%))				
F10. Alcohol Use disorder	1705 (68.5)	3659 (62.1)	< .001	Φ = .061
F11. Opiate Use disorder	310 (12.4)	1520 (25.8)	< .001	Φ = .148
F12. Cannabis Use disorder	880 (35.3)	2145 (36.4)	.357	Φ = .010
F14. Cocaine Use disorder	944 (37.9)	2616 (44.4)	< .001	Φ = .060
Dependence on multiple substances	1097 (44.1)	3705 (62.9)	< .001	Φ = .174
Frequency of consumption in the 30 days prior to admission (n (%))				
Every day	1365 (55.4)	2189 (38.0)	< .001	V = .188
4–6 days per week	217 (8.8)	485 (8.4)		
2–3 days per week	352 (14.3)	809 (14.0)		
1 day per week	102 (4.1)	356 (6.2)		
Less than 1 day per week	132 (5.4)	503 (8.7)		
Did not consume	298 (12.1)	1419 (24.6)		

Table 1 (continued)

	Readmission to treatment		*p*	Effect size
	No (n = 2490)	Yes (n = 5893)		
Age of onset of use (by drug) (M (SD))				
Age of onset of use	20.95 (13.48)	19.01 (9.90)	< .001	g = .174
Comorbid Diagnostic Variables				
Presence of ICD-10 Diagnostic (n (%))				
F20—F29: Psychotic disorders	210 (8.4)	667 (11.3)	< .001	Φ = .043
• F20. Schizophrenia	99 (4.0)	376 (6.4)	< .001	Φ = .048
F30—F39: Mood disorders	520 (20.9)	1076 (18.3)	.005	Φ = -.031
F40—F43: Anxiety disorders	875 (35.1)	1710 (29.0)	< .001	Φ = -.061
F60. Personality disorders	481 (19.3)	1746 (29.6)	< .001	Φ = .107
• Cluster A: F60.0, F60.1	61 (2.4)	228 (3.9)	.001	Φ = .036
• Cluster B: F60.2, F60.3, F60.4, F60.8	240 (9.6)	1065 (18.1)	< .001	Φ = .106
• Cluster C: F60.5, F60.6, F60.7	108 (4.3)	333 (5.7)	.014	Φ = .027
• F60.9. Not specified	133 (5.3)	412 (7.0)	.005	Φ = .031
F63.0 Pathological Gambling	249 (10.0)	402 (6.8)	< .001	Φ = -.054
F90. Hyperkinetic disorder	147 (5.9)	429 (7.3)	.023	Φ = .025

Note. M = mean; SD = Standard Deviation; d.f. = Degrees of Freedom; ICD-10 as International Classification of Diseases, 10th Revision. Bivariate analyses used the chi-square (phi or Cramer's V) and Mann–Whitney U (Hedges' g) tests

the 30 days before admission had a higher probability of readmission than those who continued to consume. Moreover, patients diagnosed with personality disorders were found to be 1.499 times more likely (95% CI: 1.303 – 1.724) to experience readmission.

Outcomes and Process Therapeutic Indicators According to Readmission Treatment for Patients with Dual Disorders and Predictors of Dropout

Table 3 presents the therapeutic outcomes for patients with dual disorders in terms of discharge, retention, and adherence based on their history of readmission to treatment.

Patients who were readmitted had a greater mean number of scheduled follow-up appointments (17.49 vs. 24.15; $p < 0.001$; g = 0.368) but a lower attendance rate (69.03% vs. 61.45%; $p < 0.001$; g = 0.370). This trend was also found in diagnostic appointments.

Patients who were not readmitted had a higher rate of therapeutic discharge (16.2% vs. 7.4%) but also a higher rate of treatment dropout (37.8% vs. 33.2%).

In terms of retention, patients who have not been readmitted exhibit a significantly longer mean duration of treatment (over two months) than those who have been readmitted.

Table 4 displays a multivariate analysis exploring the factors that impact patient discharge or dropout (represented by 0 and 1, respectively). The model showed an adequate fit, the indicator of monotonic association showed a concordance percentage of 72.2%, and the concordance (C) index was 0.724.

The results of the regression analysis indicate that outpatients diagnosed with opioid dependence have twice the probability (OR = 2.183; CI: 1.186 – 4.017) of dropping out of treatment compared to those without dependence. Furthermore, more frequent

Table 2 Multivariate analysis with explanatory variables based on treatment history and readmission

Variables in the Equation			B	EXP (B)	95% CI for EXP(B)		*p*
					Lower	Upper	
Age at Admission to treatment			0.019	1.019	1.012	1.025	< .001
Gender	Male	Ref: Female	0.227	1.255	1.088	1.448	.002
Level of Education	No studies or Primary	Ref: Baccalaureate or higher	-0.154	0.858	0.742	0.991	.038
	Secondary		0.214	1.239	1.047	1.467	.013
Employment Status	Employed	Ref: Unemployed	-0.546	0.579	0.505	0.664	< .001
	Retired		0.113	1.119	0.962	1.302	.144
	Student		-0.43	0.65	0.46	0.919	.015
Cohabitation status 30 days prior	With own family	Ref: Living alone	0.042	1.043	0.852	1.277	.683
	With parents		0.414	1.512	1.288	1.776	< .001
	With friends		0.55	1.733	1.083	2.775	.022
	Prison Institution		1.234	3.435	2.414	4.887	< .001
	Residential Institutions		0.931	2.537	1.603	4.015	< .001
Main Referral Source	Family members	Ref: own initiative	-1.342	0.261	0.222	0.307	< .001
	Legal Services		-1.146	0.318	0.236	0.429	< .001
	Health Services		-1.892	0.151	0.129	0.177	< .001
	Social Services		-1.144	0.318	0.273	0.372	< .001
Substance Use Disorder according to ICD-10	Alcohol dependence	Ref: No dependence	0.091	1.095	0.957	1.252	.187
	Opiate dependence		0.534	1.706	1.424	2.045	< .001
	Cannabis Dependence		-0.1	0.905	0.791	1.035	.144
	Cocaine dependence		0.155	1.168	1.025	1.33	.020
	Polydrug dependence		0.438	1.550	1.369	1.755	< .001
Frequency of consumption	Consumption in the last 30 days	Ref: No Consumption	-0.769	0.463	0.397	0.54	< .001
Age of onset of use			-0.024	0.976	0.971	0.981	< .001
ICD-10 Diagnostic	Psychotic disorders	Ref: No disorders	0.245	1.277	1.044	1.563	.017
	Mood Disorders		-0.034	0.967	0.833	1.122	.655

Table 2 (continued)

Variables in the Equation			B	EXP (B)	95% CI for EXP(B)		*p*
					Lower	Upper	
Age at Admission to treatment			0.019	1.019	1.012	1.025	< .001
Gender	Male	Ref: Female	0.227	1.255	1.088	1.448	.002
ICD-10 Diagnostic	Anxiety disorders	Ref: No disorders	-0.082	0.922	0.811	1.048	.212
	Personality disorders		0.405	1.499	1.303	1.724	< .001

Note. No Readmission (0) vs. Readmission (1). CI: Confidence Intervals. Fit Goodness: (Pearson: $\chi^2 = 7416.363$; $p = .807$; Deviance = 7640.200; $p = .170$); Pseudo R2: (Cox & Snell = .197; Nagelkerke = .278); Concordance Statistic: .778

Table 3 Bivariate analysis of outcomes and therapeutic process indicators according to readmission to treatment for dual disorder patients

	Readmission to treatment		*p*	Effect size
	No (n = 2490)	Yes (n = 5893)		
Adherence (M (SD))				
Total follow-up appointments scheduled	17.49 (16.50)	24.15 (18.77)	< .001	g = .368
Percentage of attendance at follow-up appointments	69.03 (20.97)	61.45 (20.27)	< .001	g = .370
Total diagnostic (medical and psychological) appointments scheduled	2.22 (1.90)	3.04 (2.39)	< .001	g = .360
Percentage of attendance at diagnostic (medical and psychological) appointments	88.88 (23.29)	78.32 (29.66)	< .001	g = .378
Percentage response to telephone/telematic appointments	97.41 (10.63)	96.74 (12.03)	.033	g = .058
Retention (M (SD))				
Months in treatment	25.21 (18.70)	23.00 (18.28)	< .001	g = .120
Treatment Modality (n (%))				
Patients treated exclusively in addiction centers	1728 (69.4)	3981 (67.6)	.098	Φ = .018
Patients received coordinated treatment between addiction centers and mental health services	762 (30.6)	1912 (32.4)		
Discharge (n (%))				
In treatment	1096 (44.0)	3258 (55.8)	< .001	V = .157
Therapeutic Discharge	403 (16.2)	436 (7.4)		
Dropout	940 (37.8)	1954 (33.2)		
Referral Discharge	25 (1.0)	92 (1.6)		
Éxitus (Death)	26 (1.0)	125 (2.1)		

Note. M = mean; SD = Standard Deviation; d.f. = Degrees of Freedom; ICD-10 as International Classification of Diseases, 10th Revision. Chi-square (phi or Cramer's V) and Mann–Whitney U (Hedges' g) tests were employed for bivariate analyses

Table 4 Multivariate analysis with explanatory variables related to patient success in achieving therapeutic discharge or experiencing dropout

Variables in the Equation			B	Exp (B)	95% CI for EXP(B)		*p*
					Lower	Upper	
Age at Admission to treatment			-0.024	.976	0.960	0.992	.003
Gender	Male	Ref: Female	0.156	1.169	.370	1.644	.370
Level of Education	No studies or Primary	Ref: Baccalaureate or higher	0.237	1.267	.172	1.779	.172
	Secondary		-0.086	0.918	.661	1.347	.661
Employment Status	Employed	Ref: Unemployed	-0.117	0.889	.491	1.241	.491
	Retired		0.081	1.085	.668	1.574	.668
	Student		-0.671	0.511	.062	1.035	.062
Cohabitation status 30 days prior	With own family	Ref: Living alone	-0.373	0.689	.144	1.136	.144
	With parents		-0.433	0.649	.040	0.980	.040
	With friends		0.450	1.568	.500	5.803	.500
	Prison Institution		-0.248	0.781	.541	1.727	.541
	Residential Institutions		-0.137	0.872	.782	2.297	.782
Main Referral Source	Family members	Ref: Own initiative	-0.441	0.643	.023	0.942	.023
	Legal Services		-0.695	0.499	.027	0.924	.027
	Health Services		-0.183	0.833	.366	1.238	.366
	Social Services		0.099	1.105	.652	1.702	.652
Substance Use Disorder according to ICD-10	Alcohol dependence	Ref: No dependence	0.007	0.993	.968	1.393	.968
	Opiate dependence		0.781	2.183	.012	4.017	.012
	Cannabis Dependence		-0.218	0.804	.196	1.119	.196
	Cocaine dependence		0.006	1.006	.969	1.384	.969
	Polydrug dependence		0.271	1.311	.073	1.762	.073
Frequency of consumption	Consumption in the last 30 days	Ref: No Consumption	0.451	1.570	.001	2.215	.001
Age of onset of use			0.002	1.002	0.989	1.016	.737
ICD-10 Diagnostic	Psychotic disorders	Ref: No disorders	0.008	1.008	0.608	1.671	.976

Table 4 (continued)

Variables in the Equation			B	Exp (B)	95% CI for EXP(B)		*p*
					Lower	Upper	
Age at Admission to treatment			-0.024	.976	0.960	0.992	.003
Gender	Male	Ref: Female	0.156	1.169	.370	1.644	.370
ICD-10 Diagnostic	Mood Disorders	Ref: No disorders	0.269	1.309	0.910	1.883	.146
	Anxiety disorders		-0.185	0.831	0.613	1.128	.235
	Personality disorders		-0.110	0.896	0.651	1.232	.499
Treatment Modality	Coordinated treatment with Mental Health	Ref: Treatment only in Drug Centers	-0.036	0.965	0.706	1.319	.823
Outcomes and Therapeutic Process Indicators	Percentage of attendance at diagnostic (medical and psychological) appointments		-0.004	0.996	0.990	1.001	.136
	Percentage of attendance at follow-up appointments		-0.022	0.979	0.972	0.985	< .001
	Percentage response to telephone/telematic appointments		0.001	1.001	0.987	1.015	.918
	Months in treatment		-0.023	0.978	0.969	0.987	< .001
	Readmissions	Ref: No readmissions	0.474	1.606	1.189	2.170	.002

Note. Therapeutic discharge (0) vs. Dropout (1). CI: Confidence Intervals. Fit Goodness: (Pearson: $\chi^2 = 1331.345$; $p = .180$; Deviance = 1342.561; $p = .129$); Pseudo R2: (Cox & Snell = .116; Nagelkerke = .171); Concordance Statistic: .724

substance users (OR = 1.570; CI: 1.113 – 2.215) and outpatients with previous readmissions (OR = 1.606; CI: 1.189 – 2.170) are more likely to discontinue treatment. Conversely, a lower probability of dropout was observed in older patients (OR = 0.976; CI: 0.960 – 0.992). The probability of dropping out of treatment also depends on specific variables related to the therapeutic process. In particular, patients who attend follow-up appointments more frequently (OR = 0.979; CI: 0.972 – 0.985) and those who are in treatment for a longer duration (OR = 0.978; CI: 0.969 – 0.987) are less likely to discontinue treatment.

Discussion

This study aims to add to the growing body of knowledge on outpatient addiction treatment outcomes for individuals with DD. EHRs offer valuable insights into patient and treatment-related variables affecting readmission and dropout rates. However, caution is warranted when analyzing EHRs to avoid false positive errors (Kim & Kim, 2019) and to account for the high variability in data recording (Grzenda & Widge, 2024), which can pose limitations. Consequently, in this study, the importance of the variables was determined by considering both effect size and statistical significance to mitigate this issue as much as possible. Furthermore, as a retrospective cohort study, it is not feasible to definitively establish causality (Hernán & Robins, 2020) due to the inherent limitations of the study design. Nevertheless, the data enable the generation of correlational associations and the formation of hypotheses regarding causality. This is facilitated by the collection of information on certain predictor variables at the onset of treatment or during its course, including indicators of the therapeutic process, such as adherence. Therefore, cohort studies allow for a deeper understanding of the progression of treatment up to the outcomes (Grimes & Schulz, 2002; Levin, 2006). As Brorson et al. (2013) and Grover et al. (2021) have observed, there remains a limited understanding of the factors influencing outcomes such as dropout or readmission in the substance use disorder literature, particularly in relation to therapeutic process indicators. This study aims to address this gap by examining how these outcomes manifest in dual patients, a group whose comorbidity, as documented in the literature, negatively impacts the therapeutic process and outcomes.

In line with our first objective, we observed differences in the analysis of admission profiles between the two groups of patients, enabling us to identify some variables associated with treatment readmission. The literature on SUD and gender has yielded inconsistent findings regarding its impact on readmission and therapeutic outcomes (McHugh et al., 2018). Similar to our study, some authors have reported that women have a lower likelihood of readmission (Hutchison et al., 2019) and relapse (Logan et al., 2020). Meanwhile, Maturana et al. (2023) and Smith et al. (2015) reported that women had a greater likelihood of readmission. The reasons for the variations in outcomes of SUD treatment remain unclear. Some authors (Agabio et al., 2016; McHugh et al., 2018; Ribeiro & Marinho, 2012) suggest that women experience higher unemployment rates, poverty, and social problems, which may contribute to worse outcomes. However, women also tend to seek help from doctors and health professionals more frequently than men (Callaghan & Cunningham, 2002), which may act as a factor in avoiding readmission. It is imperative to acknowledge the complexity of gender differences in treatment and the need for further research to understand the relationships among them. Consistent with most related literature (Donisi et al., 2016), more than 70% of the readmitted patients were unemployed or retired. Other studies have reported that nearly 50% of readmitted patients fall into these

categories since having a SUD and a psychiatric comorbidity tend to be stigmatized and therefore associated with losing jobs (Böckmann et al., 2019; Ramadan et al., 2022). Previous studies (Böckmann et al., 2019; Carrier et al., 2011; Donisi et al., 2016) have suggested that living with children, a partner, or relatives may enhance the likelihood of reducing readmission. In our study, it appears that those patients living with their families of origin were more likely to be in the readmitted group. Family support can protect against readmission (Lorine et al., 2015), but it may also encourage individuals to seek treatment on their own when they need it. On the other hand, residing in prison within 30 days before treatment admission appears to be a significant predictor of readmission. This may be attributed to the high prevalence of individuals who suffer from SUDs in prisons (Bronson et al., 2017; Fazel et al., 2017). Additionally, SUDs may be at risk of readmission to both prisons and addiction treatment (Sadeh & McNiel, 2015), as mandated by judges and correctional facilities. The likelihood of this occurrence tends to increase when a comorbid mental disorder is present. Kopak and Raggio's (2023) study suggested that in certain areas, particularly rural ones, prisons have taken on the role of primary care centers for specific populations. Therefore, some jails have been tasked with providing or referring medical attention or addiction treatment to inmates who require it. On the other hand, according to the results, patients with multiple admissions appear to seek treatment voluntarily more frequently. It is worth noting that not consuming within the previous 30 days was a significant factor among those who were readmitted. In some cases, patients who have undergone or dropped out of treatment may have reverted to consumption and recognized a problematic pattern. In such instances, individuals may have attempted to remain abstinent and considered the need to either return to treatment or continue receiving care (Bernstein & D'Onofrio, 2017). This finding may also help explain the high percentage of patients who seek help on their own when experiencing a possible relapse in their habitual consumption. In their 2019 publication, Böckmann and colleagues suggested that early readmission could aid in preventing relapse and averting the exacerbation of psychiatric comorbidities. Within this framework, other professionals in healthcare, social, or legal services may view outpatient center treatment as the most effective approach for maintaining substance abstinence. It is necessary to consider this information when developing treatment plans for these individuals. Patients referred by the health system had a lower readmission rate. These findings are consistent with those reported by Dacosta-Sánchez et al. (2024). The authors suggest that this may be due to the authority of clinicians in promoting the benefits of starting treatment.

The results imply that readmitted patients often have an opioid or cocaine use disorder. The findings of other authors, such as Ramadan et al. (2022) and San et al. (2013), have suggested that these SUDs may act as potential triggers for readmission. Furthermore, the present study identified the presence of personality disorders, specifically Cluster B (antisocial, borderline, histrionic, and narcissistic), among readmitted patients. According to the literature, personality disorders are commonly observed in patients diagnosed with substance use and are linked to both cocaine use (Cavalera et al., 2020; Oliva et al., 2021) and opioid use (Santo et al., 2022).

Regarding the second objective, the strongest predictors of dropout seem to be opioid use disorder, substance consumption in the 30 days prior to admission, and the therapeutic process indicators, specifically non-adherence to follow-up appointments and less time spent in treatment. In addition, having previous readmissions also predicts subsequent abandonment. However, there are a few variables that need to be considered. In contrast to readmission rates, dropout rates are more likely to occur among younger patients. This is supported by the results of the review conducted by Brorson et al. (2013), which identified

patient youth as one of the predictors of dropout. Previously, it has been reported that opioid use disorder is a more prevalent condition among readmitted patients than single-admission patients. It is important to note that opioid use disorder also seems to increase the likelihood of treatment abandonment, potentially perpetuating a self-defeating cycle. Therefore, the disorder may result in dropping out and needing new treatment. The relationships between opioid use and both treatment dropout (Basu et al., 2017; Brorson et al., 2013; Marcovitz et al., 2016) and readmission (Ramadan et al., 2022; Santo et al., 2022) have previously been documented in specialized literature, both in the context of the disorder itself and the consumption of the substance.

Moreover, as per previous literature (Ghosh et al., 2022), the discharge status of patients, whether they received a therapeutic discharge from their clinicians or dropped out before receiving it, affects readmission. Similarly, the study showed that a greater proportion of patients who had a single admission were successfully discharged. However, it is worth noting that they also tend to drop out of treatment more frequently than those who are readmitted (Donisi et al., 2016), despite being in therapy for a lengthier average number of months. Nevertheless, it has been observed that a longer duration of treatment can protect against dropout in dual patients (Daigre et al., 2019, 2021; González-Saiz et al., 2014). Therefore, it is imperative to strive for good treatment retention to avoid dropout and relapse. In terms of adherence, patients with more than one treatment admission had a greater number of scheduled appointments but a lower percentage of visits. Both retention and adherence have previously been shown to play principal roles in treatment success (Dacosta-Sánchez et al., 2022; NIDA, 2018; Viera et al., 2020).

It is worth noting that despite the limitations inherent to using EHRs, this study includes one of the largest samples of dual patients in outpatient centers to date. A sample of this size enhances the representativeness of the studied population, thereby increasing the external validity of the findings. The extensive data collected allows for more robust analyses and more reliable conclusions regarding trends and outcomes within this specific population. Additionally, this study included comprehensive data on patient admissions and outcomes, offering a detailed overview of their clinical trajectory. Such information is crucial for gaining a deeper understanding of the factors influencing the care and outcomes of dual patients and can help identify areas for improvement in clinical practice and health management. Furthermore, it is important to highlight that most previous studies have been conducted in hospitals or inpatient facilities. In contrast, this study focused on outpatient centers, providing a unique perspective on the care of dual patients in a less intensive setting. The results of this study could help clinicians keep better track of DD patients who drop out of treatment and re-enter the system later.

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Data Availability https://doi.org/10.17605/OSF.IO/Y8E6H.

Declarations

Ethics and Approvals The study received ethical approval from the Research Ethics Committee of the Ministry of Health in Andalusia, ensuring that it met the ethical standards for data management. The storage

and coding of the data adhered to the General Health Law of April 25, 1986 (Spain) and Law 41/2002 of November 14, which regulate the autonomy, rights, and obligations of patients regarding clinical information and documentation. Additionally, compliance with the Organic Law 3/2018 of December 5, 2018, governing the safeguarding of personal data and digital rights, adapted to European regulations, has been guaranteed.

Conflict of Interest Authors declare that they have no conflicts of interest.

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