Cannabis use the week before admission to psychiatric in-patient service as a marker of severity

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A B S T R A C T

Objective: To evaluate if cannabis dose recorded as standard joint unit (SJU)
consumed before admission and other related factors have an influence on psychiatric inpatient's symptom severity and clinical outcomes.
Methods: Cross-sectional study in an acute psychiatric inpatient unit including 106 individuals. Quantity of cannabis was measured as SJU and symptoms severity through the Brief Psychiatric Rating Scale (BPRS). Secondary outcomes (e.g. length of stay) were also assessed. Bivariate analyses and multivariate analyses were performed to determine the effect of SJU consumed before admission on measures of clinical severity.
Results: Point prevalence of cannabis use before admission was 25.5%. Mean BPRS score was 55.8 (SD = 16.1); and 62.9 (SD = 11.1) among cannabis users. A low degree positive correlation between SJU consumed the week before admission and BPRS score (r_s = 0.28, p = 0.03) was found. In the multivariate analyses both main diagnostic group, Schizophrenia and other psychotic disorders vs. others (Bipolar and Unipolar Affective Disorders and Addictive disorders) (B = 8.327; 95% CI 4.976–11.677) and need of PRN ("pre re nata" or when necessary) administration of antipsychotics and benzodiazepines (B = 12.13; 95% CI 6.868–17.393) were significant predictors, both increasing BPRS score.
Conclusions: The study did not find a correlation between SJU consumed last week and psychiatric severity. On the other hand, individuals with psychotic disorders reported a higher prevalence of cannabis use the week before admission and displayed higher BPRS scores, which points to the need for the development of tailored interventions for high-risk groups. The SJU is a useful quantification tool suitable for further clinical research.

1. Introduction

The European Monitoring Center for Drugs and Drug Addiction 2019 statistical bulletin reported that the prevalence of cannabis use among people aged 15–34 in Spain is 18,3% (Ng et al., 2007); according to the EDADES report (2019) from the Spanish observatory for drugs and addictions (OEDA) cannabis use prevalence in Spain has increased from 14,5% in 1995 to 35,2% in 2017 (Delegación del Gobierno para el Plan Nacional sobre Drogas, 2019). More so global tendencies point out cannabis use will increase furthermore, making it a priority to determine its medical and societal implications.

A recent study that identified more than 2,8 million admissions with documented cannabis abuse/dependence found that approximately one out of five patients was admitted for a primary diagnosis of a mental health disorder (Charilaou et al., 2017). Cannabis seems to be strongly associated with mental health disorders as a whole and when the most common disorders are examined individually (Lai and Sitharthan, 2012). It seems that besides the shared vulnerabilities between disorders, the presence of a mental illness itself is a vulnerability factor for addiction, despite the heterogeneity across comorbidities (Lowe et al., 2019).

A study looking at over 17,000 individuals associated cannabis use not only with psychiatric hospitalization, but found a dose–response relationship in which heavy users had an odds ratio for hospitalization of 6.2 (vs. 1.6 for incidental users) (Schubart et al., 2011). Even more, it has been shown that co-occurrence of cannabis use disorder (CUD) and psychiatric disorders is associated with greater symptom severity, poorer treatment outcomes, and greater health service use relative to patients without a CUD co-morbidity (Stinson et al., 2006). The relationship between cannabis use and severity of psychotic and affective disorders has been previously studied for inpatient populations (Balan Moshe et al., 2018; Colizzi et al., 2018; Rylander et al., 2018). One study assessed the influence of cannabis use on psychotic and affective symptom severity, finding that users had more prominent psychotic symptoms (Katz et al., 2010). Additionally, there seems to be an association between CUD and an almost three fold increase in the odds of mania symptoms (Gibbs et al., 2015).

Although quantities seem to influence cannabis-related outcomes, until now its use has been mainly assessed by frequency. To our knowledge there are no studies using a standardized measure for quantification of cannabis to assess its impact on symptom severity in clinical populations. On 2017 the Standard Joint Unit (SJU) was set by

our group based on quantity of 9-Tetrahydrocannabidol (9-Δ-THC) found in cannabis (Casajuana et al., 2018):1 SJU = 1 joint = 0.25 g of cannabis = 7 mg of 9-Δ-THC (Casajuana Kögel et al., 2017), allowing for a more systematic assessment of cannabis use. It is a useful tool to measure the dose of used drug in a similar way to the standard drink unit, and similarly a field work was done to define the median dose by unit consumed. The SJU was obtained by assessing amount of 9-Δ-THC and CBD in 315 joints (marihuana and hashish) donated voluntarily by 492 participants in universities, leisure spaces, mental health services and cannabis clubs in Barcelona. Making the SJU useful for clinical, epidemiological and research purposes in our sample. Furthermore, it can be used to measure both frequency and quantity of use (Casajuana Kögel et al., 2017).

1.1. Aims of the study

First of all, this study intended to evaluate if the dose of cannabis (measured as SJU) consumed the week before admission and other co-factors had an impact on acute psychiatric inpatient's symptom severity. As a secondary objective, we also intended to evaluate its impact on other indirect indicators of clinical severity (need for physical restraint and PRN administration of medication, and length of stay). Lastly, we planned to explore the quantity of cannabis consumed before admission in an acute inpatient psychiatric unit. According to previous literature and clinical experience, our main hypothesis was that higher quantity of cannabis consumed the week before admission would be associated with higher clinical severity.

2. Materials and methods

2.1. Setting and study population

We present an observational cross-sectional study conducted in an acute psychiatric inpatient unit at a tertiary hospital in Barcelona. All patients admitted between March and August 2018 were invited to participate. Exclusion criterion was having cognitive impairment that prevented comprehension of study and assessment. Sixteen patients were excluded due to cognitive impairment (± 10%) that prevented to have an honest conversation between the researchers and the patient, and understand the aim of the study, the risk and the benefits. Exclusion criterion due to cognitive impairment was both an ethical and clinical criterion (see Fig. 1). In consequence, we assessed the cognitive impairment with an ethical approach; in other words, we evaluated if the patient was able or not to understand the implications of its participation. The final sample included 106 patients (66.7% of all admissions, see Fig. 1). The study followed the STROBE (Strengthening the Reporting of Observational studies in Epidemiology) Statement Checklist for cross-sectional studies.

Quantity of cannabis consumption the week before admission was measured as SJU, a standardized measure useful to asses both frequency and quantity of cannabis use: 1 SJU = 1 joint = 0.25 g of cannabis = 7 mg of 9-Δ-THC. Cannabis consumption was assessed the week before admission for two reasons: 1) The BPRS is a useful clinical tool to assess psychopathology in the previous week. For this reason, Cannabis consumption was assessed the week before admission (the same time frame than BPRS); 2) we chose to focus on the acute effect of cannabis use on psychopathology.

Qualified physicians administered the Brief Psychiatric Rating Scale (BPRS) during the first week of admission as the main measure of clinical severity. The BPRS is an 18-item scale, administered in 15–25 min by a trained therapist and it is useful to assess general psychopathology (psychotic, mania, anxiety, and depressive symptoms). Every item can score from 1 to 7. It is useful to investigate what has happened in the previous week. Internal consistency is adequate (Cronbach alpha 0.79) and the inter-rate confidence is excellent (0.94) (Dazzi et al., 2016). The need for physical restraint and PRN

administration of antipsychotics and benzodiazepines were used as an indirect measure for agitation/aggression. These two variables, along with the length of stay (LoS) were used as secondary indicators of clinical severity. Although there is no formal discharge protocol the current practice establishes the following criteria: 1) relief of subjective distress referred by the patient; 2) nursing and medical team appreciate an improvement of disrupting behavior previous to the admission and medication is well-tolerate and dose is stable; 3) relatives report adequate readapting to the state before the psychiatric crisis; 4) co-morbidities are under control by respective specialists. Qualitative use of other substances (alcohol, hallucinogens, psychostimulants, opioids, tobacco, and other drugs) and other socio-demographical data (eg. age, sex), length of stay and other covariates/potential confounders (eg. illness duration in years) were extracted through an ad hoc questionnaire and chart review. Previous informed and signed consent was obtained for all activities involving the study.

Diagnoses were determined by reviewing all admission and discharge diagnoses for inpatient and medical observation encounters available. Two types of patient were admitted: those already diagnosed in out-patient clinics and those who onset of disorder was previous to the admission and had not formal diagnosis. Clinical diagnosis based on DSM5 criteria was the standard in both cases. Three main "diagnostic groups" arose: Schizophrenia and other psychotic disorders, Bipolar and Unipolar Affective Disorders and Addictive disorders. We decided to cluster the diagnosis according to the most frequent diagnosis at the admission in our unit (Schizophrenia and other psychos, Affective disorders, Addictive disorders), although we are aware that other diagnoses were possible (e.g. severe anxiety disorders including OCD), it is very unusual. By clustering we tried to target on the most prevalent conditions in the psychiatric ward and at the same time to facilitate the analyses.

Ethical approval

Permission to conduct the study was obtained from the local Ethics Committee for Clinical Research of Hospital Clinic de Barcelona (HCB/ 2017/0795). This study was performed in accordance with the guidance on Good Clinical Practice (CPMP/ICH/135/95) and with the ethical principles stated in the Declaration of Helsinki 1964, as revised at the 64th Wolrd Medical Association (WMA) General Assembly in Fortaleza, Brazil, October 2013.

2.2. Statistical analysis

Data were analyzed with IBM SPSS Statistics 23.0. Patient characteristics and collected data were summarized using descriptive statistics. Continuous data is presented as means with standard deviation and categorical variables are presented as number counts with percentages. Bivariate analyses (Rho spearman correlation, Chi-square test of association, independent samples t-test, one-way ANOVA) were performed. The analyses included those variables considered to be clinically relevant as well as those shown to be important from mental health perspective by previous literature (age, duration of illness, use of other drugs) (Campeny et al., 2020; Cheng et al., 2016; Newman et al., 2018; Schubart et al., 2011).

Those variables that were statistical significant in the bivariate analyses ($p < 0.05$) for the dependent variable (PRN vs no PRN, Need of physical restraint vs no need, scoring in BPRS) were included in the multivariate analyses: SJU per week, sex, age, need of PRN medication and physical restraint. Those deemed clinically relevant (co-morbid substance use) were also incorporated into adjusted models. Binomial logistic regression was used to measure dichotomous outcomes and multiple linear regression was used to measure continuous outcomes.
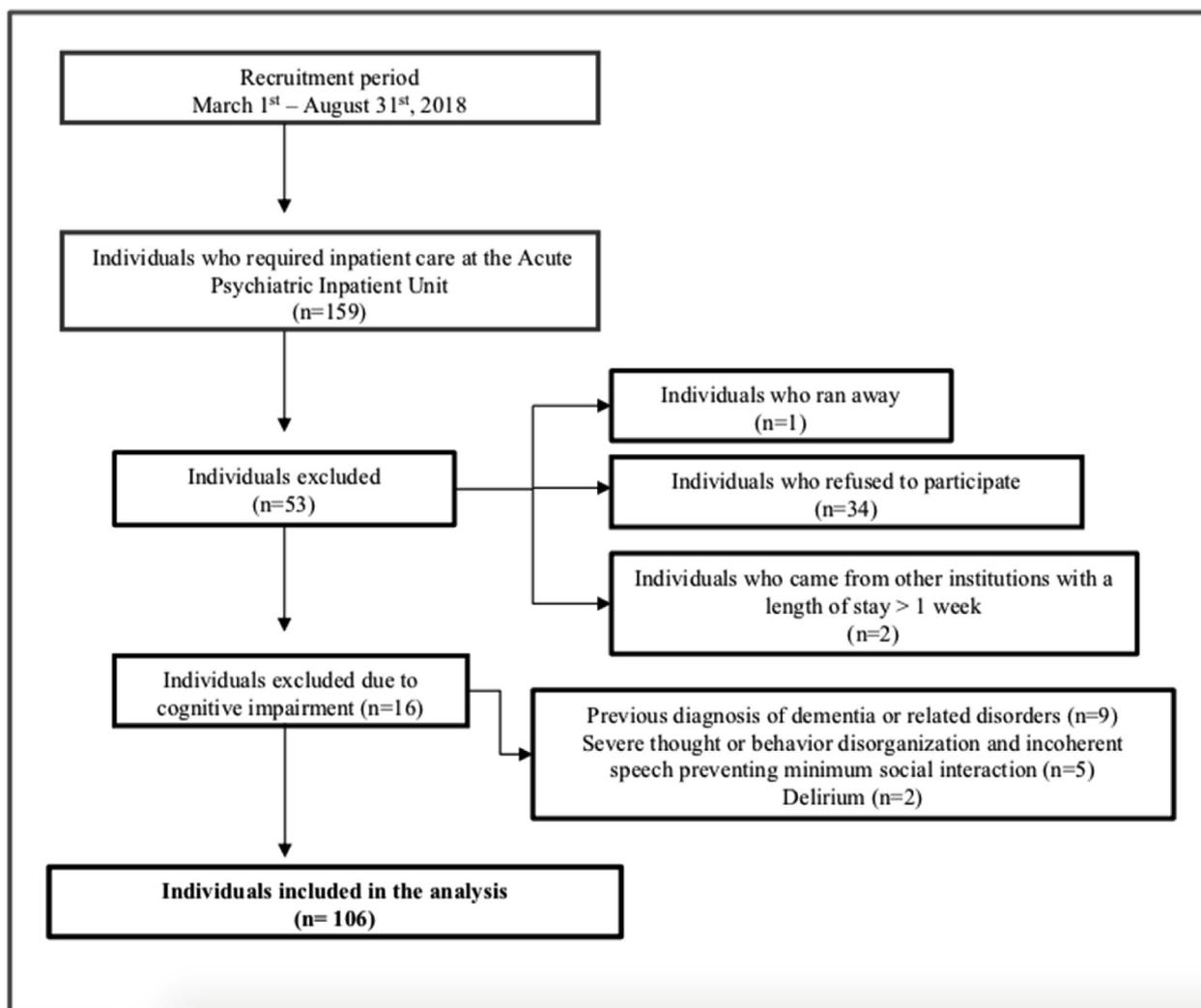
Fig. 1. Study sample flow chart.

3. Results

A total of 106 (66.7%) individuals were included in the final analysis (see flow diagram in Fig. 1). The mean age was 46.05 years, and 52.8% were females. A total of 27 (25.5%) individuals reported cannabis use the week before admission. The mean quantity of cannabis consumed the week before admission was 17.6 SJU (SD = 17,4), this is equivalent to 123.2 mg of 9-Δ-THC. The minimum quantity of use the week before admission that was reported was 1 SJU (or 7 mg of 9-Δ-THC) and the maximum was 70 SJU (or 490 mg of 9-Δ-THC). The mean BPRS score in the whole sample was 55.8 (SD = 16.1) and 62.9 (SD = 11.1) among cannabis users. A more detailed description of the sample is included in Table 1.

On bivariate analyses, a positive statistically significant correlation was found between cannabis quantity (SJU) consumed before admission and BPRS score (r_s = 0.28, p = 0.03). For patients who reported cannabis consumption the week before admission BPRS scores (M = 62.93, SD = 11.09) were significantly higher (t (69.09) = 3.37, p = 0.001) compared to non-users (M = 53.29, SD = 16.88). We also found that BPRS scores in patients who needed PRN neuroleptic/sedative medication (M = 63,20, SD = 13,38) was significantly higher (t (104) = 6,38, p < 0,0005) compared to patients who did not need it (M = 46,02, SD = 14,19), for those who needed physical restraint (M = 69,09, SD = 13,16) compared to those who didn't (M = 52,05, SD = 14,93) statistical significance was also reached (t (104) = 4,96,

p < 0,0005). Furthermore, we performed bivariate analyses to evaluate the relationship between other substances used (e.g. alcohol) and BPRS, finding no statistically significant difference.

An independent-samples t-test was run to determine if there were differences in SJU taken the week before admission between patients who needed physical restraint during admission and patients who didn't. Number of SJU were higher in patients who needed physical restraint (M = 8.52, SD = 14.40) than in patients who didn't need it (M = 3.37, SD = 10.54), but no statistically significant difference was found, M = 5.15, 95% CI [-1.43; 11.73], t (28.84) = 1.60, p = 0.12.

An independent-samples t-test was run to determine if there were differences in SJU taken the week before admission between patients who needed PRN neuroleptic/sedative medication during admission and patients who didn't. Number of SJU were higher in patients who needed PRN neuroleptic/sedative medication (M = 7.08, SD = 14.58) than in patients who didn't need it (M = 1.11, SD = 3.85), a statistically significant difference was found (M = 5.98, 95% CI [2.05; 9.90], t (69.49) = 3.04, p = 0.003). On the other hand, no statistically significant correlations were found between SJU consumed before admission and length of stay.

As can be seen in Table 2, a one-way ANOVA was conducted to determine if the number of SJU taken the week before admission and BPRS score were different between patients in the three main diagnostic groups: Schizophrenia and other psychotic disorders (n = 35), Bipolar and Unipolar Affective Disorders (n = 44) and Addictive Disorders

Table 1

Sample's sociodemographic and clinical characteristics.

	Whole sample(n = 106)	Cannabis users (n = 27)	Schizophrenia/Psychotic disorders (n = 35)	Bipolar/Affective Disorders (n = 44)	AddictiveAddictive disorders (n = 27)
Age -years- [M ± SD]	46.05 ± 17.58	34.52 ± 13.33	35.02 ± 11.94	52.57 ± 20.07	49.71 ± 12.09
Sex (female)	52.8%	40.7%	28.6%	68.2%	59.3%
Illness Duration in Years [M ± SD]	17.42 ± 14.64	10.22 ± 11.58	10.34 ± 11.28	17.89 ± 17.08	23.85 ± 10.35
Previous use of antipsychotic drugs	77.4%	81.5%	74.3%	79.5%	77.8%
Cannabis Use	25.5%	–	40.0%	25.0%	7.4%
SJU consumed the week before admission [M ± SD]	4.49 ± 2.85	17.63 ± 17.42	8.26 ± 16.44	3.43 ± 8.29	1.33 ± 6.73
Use of other drugs	45.3%	70.4%	48.1%	38.6%	48.1%
Alcohol Use	41.5%	51.9%	37.1%	20.5%	81.5%
Tobacco Use	56.6%	77.8%	57.1%	43.2%	77.8%
Need of PRN sedative/ neuroleptic medication	55.7%	81,5%	71.4%	52.3%	44.4%
Need of physical restraint	21.7%	40.7%	40.0%	18.2%	3.7%
BPRS score [M ± SD]	55.75 ± 16.13	62.93 ± 11.09	65.69 ± 10.783	56.25 ± 15.88	42.04 ± 12.35
Length of stay (days)[M ± SD]	22.49 ± 2.85	21.52 ± 10.94	23.23 ± 15.96	20.84 ± 10.50	24.22 ± 10.62

Abbreviations: SJU = Standard Joint Units; BPRS = Brief Psychiatric Rating Scale; PRN = pro re nata/as needed.

Table 2

Summary of one-way ANOVA analyses to determine if the number of SJU taken the week before admission and BPRS score were different between patients in the three main diagnostic groups.

	Number of SJU consumed the week before admission[a]	Brief Psychiatric Rating Scale (BPRS)
Addictions	N = 27; x = 1.33; SD = 6.73	N = 27; x = 42.04; SD = 12.34
Bipolar/Affective Disorders	N = 44; x = 3.34; SD = 8.29	N = 44; x = 56.25; SD = 15.87
Psychosis/Schizophrenia	N = 35; x = 8.26; SD = 16.44	N = 35; x = 65.69; SD = 10.78
Total	N = 106; x = 4.49; SD = 11.60	N = 106; x = 55.75; SD = 16.12

ONE WAY ANOVA RESULTS	Sum of Squares	Df	Mean Square	F	Sig
Between groups	8543.36	2	4271.683	23.455	*p < 0.0005*
Within groups	18758.75	103	182.124		
Total	27302.12	105			

Df: Degrees of freedom.

[a] Levene test of homogeinity of variances p-value < 0.05.

(n = 27). The number of SJU taken the week before admission increased from the Addictive Disorders group (*M* = 1.33, *SD* = 6.73) to the Affective Disorders group (*M* = 3.43, *SD* = 8.29), and Psychotic Disorders group (*M* = 8.26, *SD* = 16.44), in that order, but the differences between these groups were not statistically significant, Welch's $F(2, 62.19) = 2.65$, *p* = 0.079. BPRS score was statistically significantly different between the three main different diagnostic groups, $F(2, 103) = 23.46$, *p* < 0.0005.

Negative statistically significant correlations were found between cannabis quantity (SJU) consumed before admission and age (r = −0.32, p = 0.001) and between BPRS scores and age (r = −0.36, p < 0.0005). BPRS scores were also significantly higher (t (104) = 2.65, p = 0.009) in males (M = 62.93, SD = 11.09) than in females (M = 51.93, SD = 16.22).

As can be seen in Table 3, a multivariate regression analysis was conducted to determine the effect of the number of SJU consumed before admission on clinical severity measured as BPRS score at admission. We controlled by sex, age, main diagnostic group and need of PRN neuroleptic/sedative medication and physical restraint during admission. Both main diagnostic group, Schizophrenia/Psychosis vs.

Table 3

Multiple regression model examining the influence of SJU consumed before admission on BPRS score (dependent variable) while controlling for sex and age, main diagnostic group and need of PRN neuroleptic/sedative medication and physical restraint during admission.

	Beta (CI 95%)
SJU the week before admission	−0.093 (−0.304–0.118)
Age	−0.120 (−0.262–0.022)
Sex (female)	- 1.922 (−6.664–2.821)
Diagnostic Group (Psychosis VS others)	8.327 (4.976–11.677)[a]
Need of PRN drugs	12.13 (6.868–17.393)[a]
Need of physicalrestraint	4.107 (−2.292–10.506)

[a] *P-value < 0.05.*

others (B = 8.327; 95% CI 4.976–11.677) and need of PRN drugs (B = 12.13; 95% CI 6.868–17.393) were the only significant predictors in the full model, both increasing BPRS score. The whole model was statistically significant, F(6,99) = 17.362, p < 0.0005, R^2 adj = 0.483.

As can be seen in Table 4, binomial logistic analyses were conducted to determine the effect of the number of SJU consumed before admission on need of PRN sedative/neuroleptic drugs and physical restraint during admission. We controlled by sex, age, main diagnostic group and use of other drugs before hospitalization. On neither of the full models, was the number of SJU consumed before admission a significant predictor.

4. Discussion

Our objectives were to evaluate the impact of cannabis use the week before admission and the statistical association with other possible related factors on clinical severity of patients admitted to an acute psychiatric unit. To our knowledge this is the first study to use a standardized method of cannabis quantification to evaluate a heterogeneous psychiatric population. Cannabis use by patients attended in psychiatric wards is a concern because: 1) Cannabis is a risk factor of psychotic, anxiety and affective disorders (Campeny et al., 2020) 2) Cannabis use worsens the prognosis of mental illness (length of hospitalization, readmission, etc.) (Batalla et al., 2013). However, up to our knowledge this is the first attempt to assess the cannabis use in a quantitative way beyond the dichotomist approach (use/no use). Patients affected by psychosis are heavier users compared with those affected by other mental illness. Specific approach is required in this population. We found the reported global point prevalence of cannabis

Table 4

Binomial logistic regression models examining the influence of SJU consumed before admission on need of PRN sedative/neuroleptic drugs and physical restraint (dependent variables) while controlling for sex and age, main diagnostic group and use of other drugs besides cannabis before hospitalization. Statistically significant results are marked in bold.

	Need of PRN sedative/neuroleptic drugs	Need of physical restraint
SJU the week before admission	OR = 1.059(95% CI 0.975–1.15);	OR = 1.007(95% CI 0.967–1.048)
Age	OR = 0.989(95% CI 0.962–1.017);	OR = 0.980(95% CI 0.947–1.015)
Sex (female)	OR = 1.994(95% CI 0.811–4.905)	OR = 0.981(95% CI 0.324–2.967)
Diagnostic Group (Addiction VS Psychosis)	OR = 0.542(95% CI 0.162–1.808)	OR = 0.078 (95% CI 0.009–0.707) *
Use of otherdrugs	OR = 0.509(95% CI 0.212–1.222)	OR = 0.665(95% CI 0.225–1.966)
Full model	$X^2(6)$ = 17.461 p = 0.008; Nagelkerke R^2 = 0.204; Correctly classified cases 67.0%	$X^2(6)$ = 16.474 p = 0.011; Nagelkerke R^2 = 0.222; Correctly classified cases 76.4%

*P-value < 0.05.

use to be around 25%. Approximately 40% of individuals diagnosed with schizophrenia and other psychotic disorders and 25% diagnosed with bipolar or unipolar affective disorders disclosed regular cannabis use the week before admission, similar to what has been previously reported (Bonsack et al., 2006; Cervilla et al., 2018; Colizzi et al., 2018; Hansen et al., 2000; Hunt et al., 2018; Mueser et al., 2000). Furthermore, on the bivariate analyses we found that patients who reported cannabis consumption the week before admission had significantly higher BPRS scores compared to non-users, although no statistically significant difference was found in the multivariate analyses.

Our findings of higher numbers of SJU used before admission among individuals affected by psychotic disorders are worrisome, especially because evidence points to a dose–response association with the highest odds of psychotic disorder in those with the heaviest cannabis use (Marconi et al., 2016). In our sample, if we study only the subgroup of 27 cannabis users, the diagnostic category with the highest mean number of SJU (M = 20.64, SD = 20.78) is the Schizophrenia and other psychotic disorders group (n = 14). Furthermore, a recent study found daily cannabis use associates with a three-times increased odds of psychotic disorder compared with never users (adjusted odds ratio [OR] 3.2, 95% CI 2.2–4.1), reaching a nearly five-times increased odds for daily use of high-potency types of cannabis ([OR] 4.8, 2.5–6.3) (Di Forti et al., 2019). In accordance with what has been previously stressed out, identification of differences between acutely ill patients with co-morbid CUD has important implications for screening and follow-up treatment in high-risk clinical populations (Reeves et al., 2018).

Patients presenting with psychotic symptoms show a higher prevalence of cannabis use and evidence on the relationship between frequency and intensity of cannabis use and increased risk of psychotic episodes is accumulating (Di Forti et al., 2019; Ksir and Hart, 2016; Marconi et al., 2016; Murray et al., 2016; Setién-Suero et al., 2017). Both frequency and intensity of use can be standardized using the SJU for assessment. Furthermore, in patients with psychosis, cannabis use has been related to higher relapse rates, poor adherence and persistence of positive symptoms (Alvarez-Jimenez et al., 2012; Schoeler et al., 2016). But little is known about to which extent cannabis use before admission impacts on the development of the hospitalization.

In our sample, both the diagnostic group (schizophrenia and other psychotic disorders vs. others) and need of PRN measures predicted a higher BPRS score, possibly meaning a more severe clinical presentation. SJU previous week to admission was statistically significant in bivariate analyses but not in multivariate analyses, meaning that we cannot conclude that it is a risk factor for higher BPRS score.

SJU the week before the admission did not predict the BRPS symptoms and several explanations rise in this sense. First, the timeframe of cannabis use is short, so the impact of dose of cannabis may be insufficiently accurate and larger timeframe needs to be assessed (e.g. one month, a year). As the literature in alcohol research shows, the impact of alcohol on health depends of dose over time (Rehm et al.,

2013). Promising research in cannabis seems to point out that time of cannabis use impacts on psychosis onset, although evidence of the heavy use over time in severity of symptoms is lacking (Hall and Degenhardt, 2008). Second, recent changes in individual pattern of cannabis use (e.g. reducing use because the patient felt bad) are not well described in one-week timeframe; as we explored only recent cannabis use, this variation is not well-studied (further commented in the limitations section). Third, only 1 out of 4 patients (n = 27) in the sample were recent cannabis users, by considering a longer timeframe we would expect a larger sample and the risk of Beta error will be lower. Fourth, regarding psychiatric symptoms related to cannabis, the onset of cannabis use is relevant (e.g. early initiation) (Blest-Hopley et al., 2019; Ryan et al., 2020), but again this aspect is not explored in our study because we had decided to focus on recent use. Five, SJU needs more evidence of its usefulness in clinical practice. Our study fails to provide new evidence as a marker of severity of psychopathology, but it has several limitations (see below) and a previous study found relationship with risk of cannabis use disorder (Casajuana et al., 2018). Consequently, we could think that SJU is useful for predicting CUD but not severity of psychopathology, although both statements are false because both studies need to be replicated. Utility of SJU as a tool is not clear enough but it seems worthy encouraging further studies according to the scientific community needs (Freeman and Lorenzetti, 2019; Loflin et al., 2020; National Institute on Drug Abuse (NIDA), 2020; Volkow et al., 2018).

Furthermore, we found that those who were diagnosed of schizophrenia or psychotic disorders were heavier cannabis users (SJU/week) and psychopathology was more severe (BPRS) during the week previous to admission than people affected by other condition like depression, bipolar disorder or addictive disorders. Tailored interventions for dual disorders, specifically for those who are treated for psychosis and have comorbid cannabis use, is needed due to the higher quantity of cannabis use and the severity of illness. According to previous research, there seems to be a general correlation between psychiatric symptoms and cannabis use, and this subset of the inpatient psychiatric population (schizophrenia and other psychotic disorders group) seems to be at a particularly high risk for acute behavioral symptoms when they use cannabis (Johnson et al., 2016). Furthermore, this can be exacerbated by the fact that cannabis withdrawal symptoms can mimic the symptoms of psychiatric disorders, creating a confounding factor for treating the underlying disorder (Hasin et al., 2016; Lowe et al., 2019). Our results seem to differ from those found by Rylander et al. in that they did not observe differences in clinical severity outcomes amongst patients with primary psychotic-spectrum disorders.

The main limitations to our study are a small sample size in a heterogenous acute psychiatric population, not collecting urine toxicology, and it being a one-site only study. The lack of formal discharge protocol could be a confounding factor. We did not consider co-morbidities in the analyses, which could be a limitation to be taken into account. In addition, using an internally validated measure might hamper

generalization of the results. Regarding the time span of cannabis consumption (last week), we believe further studies should include longer timeframe in the analyses (Hindley et al., 2020). Substance use of other drugs was assessed qualitatively, thus the limitation of not controlling quantity consumed should be noted as it can have an effect on psychopathology. We focus only on lifetime use of other substance (yes/not) as confounding factor, therefore we recommend for future studies to include quantitative approach to other drug use, especially those drugs which has standard unit (alcohol, tobacco). For illegal drugs (different of cannabis), at least frequency of use is recommended in other studies. Regarding self-report substance use measures, we did not find any reluctance or disapproval from participating individuals while asking about substance use through the structured substance abuse questionnaire. Literature shows that self-reported substance use, including cannabis, correlates in a fairly accurate manner to positive urine toxicology tests (Fløvig et al., 2009). In fact some authors have stressed that history and scales are more reliable than drug screening for cannabis use detection (Batalla et al., 2013; Perrone et al., 2001). Furthermore, the Food and Drug Administration (FDA) and European Medicines Agency (EMA) recognize self-reporting as a tool for drug approval during clinical trials. Taking this into account the SJU is a suitable tool to obtain a quick and reliable measure of cannabis quantification, proving to be suitable as a research tool.

On the other hand our strengths rely on the use of a validated standardized unit for assessing cannabis use (which allows assessment of frequency of use and quantity of psychoactive substance at the same time), our pragmatic approach, the use of a cross-diagnostic instrument and taking into account the whole array of individuals independent of their diagnosis.

Patients who reported cannabis consumption the week before admission had significantly higher BPRS scores compared to non-users, furthermore individuals with schizophrenia and other psychotic disorders and bipolar and unipolar affective disorders reported a higher prevalence of cannabis use the week before admission (40% and 25% respectively), compared to the addictive disorders group (7,4%); this later finding could be explained by the fact that most patients admitted to our psychiatric inpatient unit with a main diagnosis of an addictive disorder do so for alcohol and/or benzodiazepine detoxification.

This study adds to the current scientific literature that CUD is a very prevalent condition across different mental health disorders previous to in-patient treatment independently of the specific diagnosis. It also adds to the current scientific literature on the effects and impact of cannabis consumption across mood disorders, psychosis and other vulnerable populations who require inpatient care.

Strong differences found in cannabis use among acute inpatients suffering serious mental illness points to the need for development of tailored interventions for high-risk groups. Therefore, cannabis use should be systematically explored at admission and mental health professionals should be able to recognize and treat withdrawal symptoms and consider providing brief intervention regarding its use when necessary. Standardized measures, such as the SJU, allow registering not only frequency of use but are also a suitable quantification tool. We encourage its use for further clinical research and invite other investigators to develop an SJU based on their population so that we can conjunctly develop and reach a consensus on a global standardized measure for cannabis use quantification, as it has been previously done with alcohol. According to our results, we recommend in future studies to focus on the different types of psychoses since they are the most affected by cannabis use (e.g. schizophrenia, schizoaffective, brief psychotic disorder, etc.).

5. Authors roles

S.M participated in the protocol redaction and submission to the ethics committee, data collection, data analysis, and manuscript elaboration; C.O participated in the data collection, data analysis and

manuscript elaboration; M.S & M.P participated in data collection. All authors participated in the revision and approved the final version of this manuscript.

6. Data statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

CRediT authorship contribution statement

S. Madero: Conceptualization, Methodology, Formal analysis, Investigation, Writing - original draft, Writing - review & editing. **C. Oliveras:** Conceptualization, Methodology, Formal analysis, Investigation, Writing - original draft, Writing - review & editing. **M.T. Pons:** Investigation, Writing - review & editing. **M. Sague:** Investigation, Writing - review & editing. **H. López-Pelayo:** Conceptualization, Methodology, Writing - review & editing, Supervision. **A. Gual:** Conceptualization, Methodology, Writing - review & editing, Supervision. **M. Balcells:** Conceptualization, Methodology, Writing - review & editing, Supervision.

Declaration of competing interest

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jpsychires.2020.05.028.

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