

Older-Adult Marijuana Users in Substance Use Treatment: Characteristics Associated with Treatment Completion

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ABSTRACT

More older adults are using marijuana and receiving substance use treatment. We used the 2015–2017 Treatment Episode Data Set-Discharges (TEDS-D) to identify characteristics associated with treatment discharge among those aged 50+ whose admission involved marijuana use. Among these discharges ($N = 130,287$), 7.0% had been admitted for marijuana use only and 93.0% for polysubstance use (13.0% marijuana-primary, 57.7% marijuana-secondary, and 22.3% marijuana-tertiary), and the overall treatment completion rate was 45%. Using logistic regression, we examined associations of detoxification, residential rehabilitation, and outpatient treatment completion with type of marijuana and other substance involvement. Compared to marijuana-only cases, marijuana-tertiary cases had higher odds of completing detoxification (AOR = 1.54, 95% CI = 1.16–2.03), marijuana-secondary cases had higher odds of completing residential rehabilitation (AOR = 1.19, CI = 1.01–1.40), and all polysubstance cases had lower odds of completing outpatient treatment. Of the polysubstance cases, treatment completion odds were higher for those with alcohol problems but lower for those with other illicit drug problems. Previous treatment, referral source, psychiatric problems, first age of marijuana use, and racial/ethnic minority status were significant factors in treatment completion. Better strategies are needed to promote treatment retention and completion among older adults admitted for marijuana use problems, especially those who also have other illicit drug problems.

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Introduction

Past-year marijuana use prevalence among the 50+ age group increased significantly over the past decade, from 2.8% in 2006/2007 to 4.8% in 2012/2013 (Han et al. 2017) and to 6.8% in 2016/2017 per our analysis of the 2016 and 2017 National Survey on Drug Use and Health (Substance Abuse & Mental Health Data Archives 2019). Marijuana use is projected to continue to rise among older adults because their risk perceptions of marijuana use are decreasing, baby boomers have more liberal attitudes toward marijuana use than prior generations, and more states are legalizing marijuana use (Hartig and Geiger 2018; Lloyd and Striley 2018).

Most older adults use marijuana recreationally, but some also use it for its purported therapeutic effects on sleep, pain, and other symptom management (Choi, DiNitto, and Marti 2017) and as a safer alternative to other substances such as opioids (Lau et al. 2015). However, with increased Δ^9 -THC (tetrahydrocannabinol) potency in marijuana products and aging-related physiological changes, ingested or smoked marijuana can adversely affect physical and mental health through

interactions with chronic medical conditions and prescription or nonprescription drugs (Mahvan et al. 2017; Monte et al. 2019; Schulte and Hser 2014). Marijuana's effects on cardiovascular burden, gait and stability, impaired cognition, and short-term psychosis are also significant concerns (Minerbi, Häuser, and Fitzcharles 2019; Taylor and Grossberg 2012). Research shows that compared to their non-using age peers, older marijuana users are more prone to injuries that in turn increase their emergency department visits, and they are more likely to drive under the influence (DUI) of alcohol and/or drugs (Choi, DiNitto, and Marti 2019; Choi et al. 2018b).

Marijuana's adverse effects are especially concerning for older adults with marijuana use disorder (4.5% of users aged 50+ based on 2016/2017 NSDUH data) who tend to be long-term heavy users. Aging-related changes in hepatic metabolism, mental health problems that may be associated with long-term marijuana use, and social isolation in late life may make older adults more vulnerable to the effects of addiction, intoxication, and withdrawal (Danovitch and Gorelick 2019; Han et al. 2017). Research consistently shows that a substantial proportion of older adults who use marijuana, especially those with

marijuana use disorder, are polysubstance abusers who also tend to suffer from poor physical health; high rates of depression and anxiety, and low socioeconomic status (Choi, DiNitto, and Marti 2016; Han and Palamar 2018). Most older polysubstance users initiated substance use early in life and have experienced negative consequences on their health, functioning, and social integration as a result (Carroll and Wu 2015).

Although only a small proportion of older adults with substance use disorders seek treatment, their treatment use is increasing. Treatment Episode Data Set-Admissions (TEDS-A), SAMHSA's compilation of information on admissions to publicly funded substance use treatment programs, showed that admissions of those aged 55+ increased from 3.4% of all admissions in 2000 to 7.0% in 2012 (Chhatre et al. 2017) and to 9.7% in 2017 (SAMHSA 2019a). In addition, older-adult admissions for cocaine/crack, marijuana/hashish, heroin, nonprescription methadone, other opiates and synthetics, and polysubstances increased, while admissions with alcohol as the primary substance decreased over the past decade (Chhatre et al. 2017; SAMHSA, 2019a). Research also shows that older adults are more likely than younger adults to complete treatment (Sahker, Schultz, and Arndt 2015; Stahler, Mennis, and DuCette 2016) and that older adults referred through criminal justice/legal mandates are more likely to complete treatment than those referred by other sources (Pickard et al. 2020).

Though a few studies described above examined older adults in substance use treatment, we found no research focused on treatment completion among older-marijuana users. Older adults' increasing marijuana use and older marijuana users' high rates of polysubstance abuse compel examination of the characteristics associated with treatment completion among those admitted to substance use treatment programs. Such an examination may offer insights for helping older adults with marijuana and/or other substance use problems seek and complete treatment.

In this study, based on the 2015–2017 Treatment Episode Data Set-Discharges (TEDS-D), we focused on discharges of those aged 50+ whose admission involved marijuana use to examine treatment completion rates and relationships between treatment completion and type of marijuana involvement. Marijuana involvement was classified into three groups: marijuana as the only substance of abuse (marijuana-only), marijuana as the primary substance with other substances as secondary (marijuana-primary), and marijuana as secondary or tertiary to other substances. Our earlier study found that, compared to marijuana-only admissions aged 55+, admissions involving other substances included more men and racial/ethnic minorities and were associated

with a higher likelihood of detoxification and rehabilitation than outpatient treatment (Choi and DiNitto 2019). However, we do not know if polysubstance use and demographic factors are associated with treatment completion, although those who engage in polysubstance use may have more difficulty completing treatment. Thus, our first hypothesis (H1) was that polysubstance use, compared to marijuana only use, would be associated with a lower likelihood of treatment completion in each treatment setting (detoxification, residential rehabilitation, and outpatient). Our second hypothesis (H2) was that treatment completion would be lower among marijuana cases whose admission involved illicit drugs rather than alcohol.

Methods

Data and sample

TEDS-D includes annual data on discharges from publicly funded substance use treatment programs. The treatment programs report data to state substance use agencies, which in turn report to SAMHSA. Data collected at admission and discharge are included, with treatment discharge status as the unit of analysis (SAMHSA 2019a). A few states have not participated in TEDS-D every year.

We included 2015–2017 data to increase the sample size of discharges aged 50+. During these 3 years, a total of 4,539,568 discharges (1,420,316 in 2015; 1,458,045 in 2016; and 1,661,207 in 2017) were recorded. Of all discharges recorded, 8.3% ($n = 375,427$), 7.6% ($n = 344,715$), and 1.0% ($n = 45,659$) were aged 50–54, 55–64, and 65+, respectively. Of all discharges among those ages 50+, 19.3% ($n = 72,498$) of those aged 50–54, 15.3% ($n = 53,702$) of those aged 55–64, and 9.0% ($n = 4,037$) of those aged 65+ involved marijuana as a problem substance. In sum, of all discharges of those aged 50+, 17.0% ($n = 130,287$) had been admitted for a marijuana-related problem and these cases were the focus of this study.

Measures

Treatment completion refers to completion of all parts of the treatment plan or program. Other discharge status codes included transfer to another substance use treatment program within a treatment episode, dropout (left against professional advice), treatment terminated by facility due to client noncompliance or violation of rules, incarceration/house confinement, death, other (moved, illness, hospitalization, or other reason), and unknown (e.g., lost or incomplete discharge record) (SAMHSA 2019b).

Marijuana-only versus polysubstance use was coded based on drug use at admission. For all discharges in TEDS-D, primary, secondary, and tertiary problem substances at admission include alcohol, cocaine/crack, marijuana, heroin, other opiates (nonprescription methadone, other opiates, and synthetics), methamphetamine/amphetamine (and other stimulants), and other drugs/substances (e.g., hallucinogens, benzodiazepines, sedatives/hypnotics, inhalants, over-the-counter medications, and other). We grouped the marijuana-involved discharges into four categories: (1) marijuana was the only problem substance (marijuana-only), (2) marijuana was the primary problem substance with other(s) as secondary (marijuana-primary), (3) marijuana was secondary to alcohol or other substances (marijuana-secondary), and (4) marijuana was tertiary to alcohol or other substances (marijuana-tertiary).

Treatment setting at admission included ambulatory detoxification, 24-h inpatient hospital or free-standing residential detoxification, short-term (≤ 30 days) residential rehabilitation, long-term (> 30 days) residential rehabilitation, ambulatory intensive outpatient treatment, and ambulatory non-intensive outpatient treatment. For multivariable regression analysis, we grouped these settings into three categories: detoxification, residential rehabilitation, and outpatient treatment.

Treatment referral sources were self or other individuals (e.g., family member, friend), alcohol/drug use care provider, other healthcare providers (e.g., physician, psychiatrist, or other healthcare professional or healthcare setting), employer/employee assistance program (EAP), school, other community entities (e.g., social service, religious organization, self-help group), and court/criminal justice referral/DUI (driving under the influence). We combined employer/EAP, school, and other community entities into a single group.

Arrest in the 30 days prior to admission was as yes (= 1) or no (= 0).

Previous treatment episode refers to any previous drug and/or alcohol treatment episode for the individual (yes = 1, no = 0).

The first age of marijuana use was coded as ≤ 14 , 15–17, 18–20, 21–29, and ≥ 30 years (oldest age category included in the data set).

The presence of a psychiatric problem (yes, no, or missing), reported by using either the American Psychiatric Association's *Diagnostic and Statistical Manual of Mental Disorders (DSM)* or the World Health Organization's *International Classification of Diseases (ICD)*.

Demographic variables included age group (50–54, 55–64, and 65+), gender, and race/ethnicity (non-Hispanic White, non-Hispanic Black, Hispanic, American

Indian/Alaska Native, Asian/Pacific Islander, Other/Multi-racial). Living arrangement at admission included independent living (living alone or with others without supervision), dependent living (living in a supervised setting), or homeless (no fixed address or living at a shelter). Also included were education (< 12 years, 12 years, 13–15 years, 16+ years), veteran status (yes, no), and census region (Northeast, Midwest, Southwest, West, US territories). Length of stay in treatment is shown for descriptive purposes only.

Analysis

All analyses were conducted with Stata 15/MP. First, we used χ^2 tests to compare demographics and treatment-related and other clinical characteristics by treatment completion status. Second, to test H1, we used separate logistic regression models with treatment completion status (completed vs. all other statuses) for each treatment setting (detoxification, residential rehabilitation, and outpatient) as the dependent variable and type of marijuana involvement (marijuana-only [reference category], marijuana-primary, marijuana-secondary, and marijuana-tertiary) as the independent variable. Our preliminary multinomial logistic regression analysis showed the same set of predictors for “transfer” and “dropout/termination” compared to treatment completion, indicating that transfer is more akin to dropout/termination than to treatment completion. Consequently, we compared treatment completion to a combined category of transfer, dropout/termination, and incarcerated/death/other status. To test H2, we used logistic regression with treatment completion status as the dependent variable and type of problem substances other than marijuana (alcohol, cocaine/crack, methamphetamine/amphetamine, heroin, other opiates, and other drugs [1 or 0 for each]) as the independent variables. Logistic regression results are presented as adjusted odds ratios (AOR) with 95% confidence intervals (CI). Statistical significance was set at $p < .05$.

Results

Demographic and clinical characteristics

Of all discharges in cases that involved marijuana among those aged 50+, 44.8% completed treatment, 16.6% were transferred to other programs/facilities, 32.4% dropped out or were terminated, and 6.2% had “other” outcomes (Table 1). Of all these discharges, 7.0% were marijuana-only, 13.0% were marijuana-primary, 57.7% were marijuana-secondary, and 22.3% were marijuana-tertiary. Of

Table 1. Year of discharge, type of marijuana and other substance involvement, and demographic characteristics by discharge status of cases involving marijuana.

	All	Treatment completed	Transferred to other facility	Dropped out/ terminated by facility	Incarcerated/ other/death
N (%)	130,287 (100)	58,405 (44.8)	21,585 (16.6)	42,165 (32.4)	8,132 (6.2)
Year of discharge					
2015	31.3	31.9	27.5	31.7	35.2
2016	32.1	32.6	29.1	32.9	32.5
2017	36.6	35.5	43.4	35.4	32.3
Marijuana involvement at admission					
Marijuana-only	7.0	6.7	7.1	7.0	8.3
Marijuana-primary	13.0	11.7	12.9	14.4	15.6
Marijuana-secondary	57.7	59.5	58.8	55.6	53.2
Marijuana-tertiary	22.3	22.1	21.3	23.0	22.9
Other problem substance involvement					
Alcohol	65.9	71.5	59.3	62.4	61.3
Cocaine/crack	31.8	29.5	29.5	35.7	34.5
Heroin	11.9	9.2	11.1	15.1	16.1
Other opiates	6.0	4.7	8.1	6.4	7.2
Methamphetamine/amphetamine	13.4	11.7	20.2	12.4	13.1
Other drug	6.9	7.7	6.3	6.2	6.7
Age (yrs)					
50–54	55.6	54.0	57.1	57.4	54.8
55–64	41.2	42.5	40.1	39.8	42.1
65+	3.1	3.5	2.9	2.8	3.1
Male	75.8	76.3	73.1	75.4	77.2
Race/ethnicity					
Non-Hispanic White	51.1	51.8	56.1	47.1	53.2
Non-Hispanic Black	32.6	31.4	30.1	36.0	31.1
Hispanic	9.8	10.4	6.6	10.7	9.3
American Indian/Alaska Native	2.4	2.8	1.6	2.2	2.2
Asian/Pacific Islander	0.8	0.6	1.6	0.6	0.5
Other/multi race	3.4	3.0	4.1	3.5	3.9
Living arrangement					
Independent living	64.3	61.4	62.3	68.1	70.7
Dependent living	12.5	12.5	13.4	11.9	13.4
Homeless	20.7	24.0	19.8	18.1	13.6
Missing	2.4	2.0	4.5	1.9	2.2
Education					
<12 years	27.9	26.0	28.2	30.1	29.1
12 years	44.1	45.3	45.4	42.0	42.8
13–15 years	19.1	19.3	18.9	19.2	18.3
16+ years	6.0	6.5	5.2	5.6	6.0
Missing	2.9	3.0	2.2	3.1	3.9
Veteran status					
Yes	7.7	8.3	8.7	6.5	6.4
No	85.1	85.1	86.1	85.3	81.2
Missing	7.3	6.6	5.2	8.2	12.4
Census region					
Northeast	37.0	40.8	14.9	42.5	39.4
Midwest	21.7	19.2	24.9	22.9	25.0
South	20.0	16.5	36.4	16.2	18.8
West	21.4	23.4	23.8	18.3	16.7
US jurisdiction/territory	0.1	0.1	0.1	0.1	0.1

Pearson χ^2 tests were used to compare differences among the four groups. All differences were significant at $p < .001$.

other substances, alcohol (61.3%) was the most common, followed by cocaine/crack (31.8%), heroin and/or other opiates (17.9%), methamphetamine/amphetamine (13.4%), and other drugs (6.9%). The majority (96.8%) of these discharges were under age 65, 75.8% were men, 32.6% were non-Hispanic Blacks, and 20.7% were homeless.

The overall associations of discharge status with type of marijuana and other substance involvement were significant. For the latter, completed treatment, compared to other statuses, included discharges with higher proportions of alcohol use problems but lower proportions of other substance use problems. With regard to

demographic factors, no distinctive patterns emerged in descriptive analyses except that dropouts/terminations included a higher proportion of non-Hispanic Blacks and transfers included a lower proportion of those in the Northeast region.

Table 2 shows that 17.1% of discharges were from detoxification, 19.9% from residential rehabilitation, and 63.0% from outpatient treatment settings. The most common referral sources were self or other individuals (38.8%), followed by court/criminal justice system/DUI referrals (28.7%). No age group difference was found with regard to other referral sources, but court/criminal justice system/DUI referrals were higher

Table 2. Treatment settings, referral sources, treatment history, and marijuana use initiation by discharge status (column %).

	All	Treatment completed	Transferred to other facility	Dropped out/terminated by facility	Other/incarcerated/death/unknown
N (%)	130,287 (100)	58,405 (44.8)	21,585 (16.6)	42,165 (32.4)	8,132 (6.2)
Treatment setting at admission					
Detoxification	17.1	27.5	12.7	7.7	3.2
Ambulatory	0.5	0.7	0.5	0.4	0.2
Hospital inpatient or free-standing residential	16.6	26.8	12.2	7.3	3.0
Residential rehabilitation	19.9	24.2	20.3	15.9	9.8
<30 days	12.2	15.9	11.3	8.8	6.4
>30 days	7.7	8.3	9.0	7.1	3.4
Outpatient	63.0	48.3	66.9	76.5	86.9
Nonintensive	48.6	38.1	44.4	60.9	70.5
Intensive	14.4	10.2	22.5	15.6	16.4
Referral source					
Self or other individuals	38.8	37.2	41.0	41.3	31.8
Substance use care provider	9.5	10.6	7.5	9.2	7.9
Other healthcare provider	9.4	7.3	12.9	10.9	7.8
Employer/EAP/other community entity	12.0	11.7	9.9	13.6	11.1
Court/criminal justice system/DUI	28.7	31.8	27.3	23.4	37.9
Missing	1.6	1.5	1.4	1.6	3.5
Arrested in 30 days prior to admission					
Yes	5.6	5.6	4.9	5.3	8.6
No	84.2	78.3	89.2	89.0	88.7
Missing	10.3	16.2	5.9	5.8	2.7
Previous treatment episode					
Yes	62.8	59.0	62.3	67.4	67.9
No	27.0	25.2	34.3	25.6	27.4
Missing	10.2	15.8	3.4	7.0	4.8
First age of marijuana use					
≤14	40.1	38.7	42.5	40.9	39.5
15–17	33.6	34.1	32.5	33.2	33.8
18–20	14.3	15.1	13.5	13.6	13.8
21–29	6.5	6.7	6.2	6.5	6.4
30+	4.6	4.5	4.4	4.8	4.5
Missing	1.0	1.0	1.0	1.0	2.0
Psychiatric problem					
Yes	5.6	2.5	6.4	8.7	9.8
No	90.2	93.8	89.8	86.8	83.2
Missing	4.2	3.8	3.8	4.5	7.1
Planned medication-assisted therapy					
Yes	5.6	0.5	1.6	5.4	10.0
No	90.2	95.2	94.9	90.2	85.9
Missing	4.2	4.3	3.5	4.4	4.1
Length of treatment stay (days)					
1–7	26.2	27.2	39.2	20.4	14.0
8–30	20.1	19.3	22.0	20.6	17.6
31–90	21.4	18.5	19.7	15.8	25.1
91–180	16.1	17.9	9.9	16.6	17.5
181+	16.2	17.1	9.3	16.6	25.8

Pearson χ^2 tests were used to compare differences among the four groups. All differences were significant at $p < .001$.

among cases aged 65+ (33.2%). Substance use care providers and other healthcare providers each accounted for a little less than 10% of referrals. Almost 63% of discharges had a previous treatment episode, but rates differed by type of marijuana involvement: 43.8%, 58.7%, 64.5%, and 66.9% for marijuana-only and marijuana-primary, -secondary, and -tertiary cases, respectively. Marijuana initiation ages were ≤17 for nearly three-quarters of discharges. Of completed treatments, 46.5% stayed for 1 to 30 days in treatment. Length of stay in treatment was the longest for “other” discharge statuses.

Additional analysis showed that treatment completion rates were the highest for detoxification (71.9%), followed by residential rehabilitation (54.4%) and

outpatient (34.4%) settings, with the latter accounting for more than three-quarters of dropout/terminated cases. Completion rates were higher for court/criminal justice/DUI referrals but lower for discharges with one or more previous treatment episodes, marijuana initiation at age ≤14, and cases with a psychiatric problem.

Associations of treatment completion with type of marijuana involvement

Table 3 shows that associations between treatment completion and type of marijuana involvement differed by treatment setting. Compared to discharges of marijuana-only cases, marijuana-tertiary cases had higher odds of completing detoxification (AOR = 1.54,

Table 3. Associations of treatment completion among discharges by type of marijuana involvement and treatment setting.

	Detoxification AOR (95% CI)	Residential rehabilitation AOR(95% CI)	Outpatient treatment AOR(95% CI)
Type of marijuana involvement: Marijuana-only vs.			
Marijuana-primary	1.05 (0.77–1.44)	0.98 (0.81–1.17)	0.83 (0.78–0.88)***
Marijuana-secondary	1.31 (0.99–1.72)	1.19 (1.01–1.40)*	0.82 (0.78–0.87)***
Marijuana-tertiary	1.54 (1.16–2.03)**	1.02 (0.86–1.21)	0.72 (0.68–0.77)***
Planned medication-assisted therapy vs. no plan	0.49 (0.40–0.60)***	0.93 (0.81–1.07)	0.35 (0.32–0.38)***
Referral source: Self or other individuals vs.			
Substance use care provider	1.19 (1.05–1.34)**	1.08 (1.01–1.16)*	1.34 (1.24–1.43)***
Other healthcare provider	1.18 (1.05–1.31)**	0.86 (0.79–0.94)**	0.79 (0.74–0.84)***
Employer/EAP/other community entity	1.38 (1.22–1.56)***	1.27 (1.16–1.39)***	1.34 (1.27–1.41)***
Court/criminal justice/DUI	2.00 (1.74–2.31)***	1.21 (1.12–1.31)***	2.17 (2.08–2.25)***
Arrested in 30 days prior to admission vs. not arrested/missing	1.00 (0.83–1.21)	1.04 (0.94–1.16)	1.04 (0.97–1.11)
Prior treatment episode vs none/missing	0.95 (0.88–1.03)	1.18 (1.10–1.26)***	0.82 (0.80–0.85)***
First age of marijuana use: ≤14 years vs.			
15–17	1.09 (1.02–1.17)*	1.06 (1.01–1.13)*	1.19 (1.15–1.24)***
18–20	1.24 (1.12–1.37)***	1.02 (0.94–1.11)	1.29 (1.23–1.36)***
21–29	1.12 (0.97–1.29)	1.03 (0.92–1.16)	1.28 (1.20–1.36)***
30+	1.02 (0.87–1.18)	1.01 (0.88–1.16)	1.13 (1.05–1.22)**
Psychiatric problems vs. no problem/missing	0.89 (0.82–0.96)**	0.76 (0.72–0.81)***	0.60 (0.58–0.62)***
Admission year: 2015 vs.			
2016	1.08 (1.00–1.17)	1.01 (0.95–1.08)	1.05 (1.01–1.09)*
2017	0.93 (0.86–1.01)	0.96 (0.90–1.02)	1.02 (0.98–1.06)
Age: 50–54 years vs.			
55–64	1.05 (0.99–1.13)	1.14 (1.08–1.20)***	1.14 (1.10–1.17)***
65+	1.17 (0.97–1.42)	1.19 (1.01–1.41)*	1.15 (1.06–1.26)**
Male vs. female	1.02 (0.94–1.11)	0.91 (0.86–0.97)**	1.20 (1.16–1.25)**
Race/ethnicity: Non-Hispanic White vs.			
Non-Hispanic Black	1.04 (0.97–1.13)	0.86 (0.81–0.92)***	0.69 (0.66–0.71)***
Hispanic	1.15 (1.04–1.28)**	0.91 (0.83–1.01)	0.88 (0.83–0.94)***
American Indian/Alaska Native	2.68 (2.19–3.29)***	0.95 (0.81–1.13)	0.81 (0.72–0.90)**
Asian/Pacific Islander	0.47 (0.32–0.69)***	0.43 (0.33–0.57)***	0.64 (0.54–0.76)***
All other	1.18 (0.997–1.40)	0.78 (0.69–0.90)**	0.83 (0.76–0.91)***
Education: <12 years vs.			
12 years	1.09 (1.01–1.18)*	1.08 (1.01–1.15)*	1.19 (1.14–1.24)***
13–15 years	1.04 (0.94–1.14)	1.23 (1.14–1.32)***	1.20 (1.14–1.25)***
16+ years	1.10 (0.95–1.28)	1.42 (1.26–1.60)***	1.39 (1.30–1.49)***
Missing	0.95 (0.78–1.17)	0.85 (0.68–1.06)	1.27 (1.15–1.40)***
Living arrangement: Independent living vs.			
Dependent living	0.84 (0.74–0.95)**	0.90 (0.84–0.97)**	1.17 (1.11–1.22)***
Homeless	1.29 (1.20–1.38)***	0.87 (0.82–0.92)***	0.74 (0.70–0.78)***
Missing	0.81 (0.62–1.05)	0.42 (0.33–0.52)***	0.96 (0.87–1.07)
Veteran: vs. not veteran/missing	1.14 (1.01–1.30)*	1.00 (0.91–1.09)	1.05 (0.99–1.12)
Region: Northeast vs.			
Midwest	0.21 (0.19–0.23)***	0.40 (0.37–0.43)***	0.90 (0.86–0.94)***
South	0.46 (0.42–0.51)***	0.43 (0.39–0.46)***	0.79 (0.75–0.82)***
West	1.02 (0.91–1.13)	0.53 (0.48–0.57)***	0.84 (0.80–0.88)***
Model statistics	N = 21,874; LR χ^2 = 2190.86; p < .001	N = 25,356; LR χ^2 = 1481.56; p < .001	N = 79,556; LR χ^2 = 7718.51; p < .001

Discharges in US jurisdictions/territories were excluded due to small numbers.

*p < 0.05; **p < .01; ***p < .001.

95% CI = 1.16–2.03); marijuana-secondary cases had higher odds of completing residential rehabilitation (AOR = 1.19, CI = 1.01–1.40); and marijuana-primary, -secondary, and -tertiary cases had lower odds of completing outpatient treatment (AOR = 0.83, CI = 0.78–0.88; AOR = 0.82, CI = 0.78–0.87; and AOR = 0.72, CI = 0.68–0.77, respectively).

Table 3 also shows that while some covariates (psychiatric problem, first marijuana use age, and region) were associated with treatment completion in the same manner for all three treatment settings, others differed by setting. For detoxification, compared to self-/other individual referrals, all other referrals had higher odds of completion, but in residential rehabilitation and outpatient treatment, referrals from healthcare providers

had lower odds of completion. Prior treatment episode was associated with higher odds of completing residential rehabilitation treatment and lower odds of completing outpatient treatment. Older age groups had higher odds of completing residential rehabilitation and outpatient treatment only. Males had lower odds of completing residential rehabilitation but higher odds of completing outpatient treatment. While there was no difference between non-Hispanic Whites and Blacks in discharge status for detoxification, Blacks had lower odds of completing residential rehabilitation and outpatient treatment. Those who were homeless (compared to living independently) had higher odds of completing detoxification but lower odds of completing residential rehabilitation and outpatient treatment.

Associations of treatment completion with other substance use among polysubstance use cases

Table 4 shows that among discharges in polysubstance use cases, those that were alcohol-involved (compared to non-alcohol-involved) had higher odds (AOR = 1.21, CI = 1.16–1.25) of treatment completion, as did cases in the “other” drug category (AOR = 1.09, CI = 1.03–1.14), while cocaine/crack, heroin, other opiates, and methamphetamine/amphetamine cases had lower odds. The odds of treatment completion for heroin (AOR = 0.71, CI = 0.67–0.75) and methamphetamine/amphetamine

(AOR = 0.74, CI = 0.71–0.78) cases were lower than those for cocaine/crack and other opiates.

Discussion

This study showed that the treatment completion rate among discharges aged 50+ whose cases involved marijuana was 45%. Outpatient settings accounted for almost a third of discharges among marijuana-involved cases and had the highest dropout/termination rate. There are two main findings. First, controlling for other clinical and

Table 4. Association of treatment completion with other substance use among discharges admitted for polysubstance use (marijuana-primary, -secondary, and -tertiary) problems.

	AOR(95% CI)
Other substance(s) involved	
Alcohol vs. no alcohol	1.21 (1.16–1.25)***
Cocaine/crack vs. no cocaine/crack	0.84 (0.82–0.87)***
Heroin vs. no heroin	0.71 (0.68–0.75)***
Other opiates vs. no other opiates	0.83 (0.78–0.87)***
Methamphetamine/amphetamine vs. no methamphetamine/amphetamine	0.75 (0.72–0.79)***
Other substances vs. no other substances	1.09 (1.03–1.14)**
Treatment setting at discharge: Detoxification vs.	
Residential rehabilitation	0.52 (0.49–0.54)***
Outpatient	0.18 (0.17–0.18)***
Planned medication-assisted therapy vs. no plan	0.53 (0.50–0.57)***
Referral source: Self or other individuals vs.	
Substance use care provider	1.27 (1.22–1.33)***
Other healthcare provider	0.87 (0.83–0.91)***
Employer/EAP/other community entity	1.26 (1.20–1.31)***
Court/criminal justice/DUI	2.08 (2.01–2.15)***
Arrested in 30 days prior to admission vs. not arrested/missing	0.98 (0.93–1.03)
Prior treatment episode vs none/missing	0.90 (0.88–0.93)***
First age of marijuana use: ≤14 years vs.	
15–17	1.12 (1.09–1.15)***
18–20	1.16 (1.11–1.20)***
21–29	1.16 (1.10–1.22)***
30+	1.07 (1.01–1.14)*
Psychiatric problems vs. no problem/missing	0.66 (0.64–0.68)
Admission year: 2015 vs.	
2016	1.05 (1.01–1.13)**
2017	0.99 (0.96–1.02)
Age: 50–54 years vs.	
55–64	1.11 (1.08–1.14)***
65+	1.16 (1.08–1.25)***
Male vs. female	1.09 (1.05–1.12)***
Race/ethnicity: Non-Hispanic White vs.	
Non-Hispanic Black	0.79 (0.77–0.82)***
Hispanic	0.97 (0.92–1.01)
American Indian/Alaska Native	0.98 (0.91–1.07)
Asian/Pacific Islander	0.54 (0.47–0.64)***
All other	0.80 (0.74–0.86)***
Education: <12 years vs.	
12 years	1.14 (1.10–1.17)***
13–15 years	1.16 (1.12–1.21)***
16+ years	1.27 (1.20–1.35)***
Missing	1.16 (1.06–1.26)***
Living arrangement: Independent living vs.	
Dependent living	1.03 (0.99–1.07)
Homeless	0.94 (0.91–0.97)***
Missing	0.70 (0.63–0.77)***
Veteran vs. not veteran/missing	1.07 (1.02–1.12)***
Region: Northeast vs.	
Midwest	0.64 (0.62–0.67)***
South	0.63 (0.61–0.66)***
West	0.82 (0.78–0.85)***

Model statistics: $N = 118,002$; $LR \chi^2 = 19231.32$; $p < .001$

Discharges in US jurisdictions/territories were excluded due to small numbers.

* $p < 0.05$; ** $p < .01$; *** $p < .001$.

demographic factors, associations between treatment completion and type of marijuana involvement differed by treatment setting. Specifically, compared to marijuana-only cases, marijuana-secondary and -tertiary cases had higher odds of completing residential rehabilitation and detoxification, respectively, whereas all marijuana-involved polysubstance cases had lower odds of completing outpatient treatment (partially supporting H1). Second, among discharges in marijuana-involved polysubstance cases, illicit drugs, compared to alcohol, further lowered treatment completion odds (supporting H2). The findings show that many older adults with marijuana use problems need additional help to complete treatment whether or not they have other substance use problems.

This study also offers insights into other factors affecting treatment completion among older marijuana users: treatment setting, first age of marijuana use, referral source, previous treatment, and demographics. People with substance use disorders are more likely to complete detoxification programs than residential rehabilitation and outpatient treatment programs (Stahler, Mennis, and DuCette 2016). This may be expected given that detoxification may be related to acute treatment episodes and often requires a shorter length of stay and commitment than longer-term residential and outpatient treatment programs. Outpatient treatment settings, where most older marijuana users received treatment, had the highest rate of dropout/termination. We speculate that daily life stressors (e.g., job, family, transportation, other life events) combined with low perceived urgency related to substance use disorder severity, especially in the case of marijuana, may be barriers to treatment completion. Older marijuana users have significantly lower marijuana risk perceptions than their non-using peers, although risk perception is much higher among those with than without marijuana use disorder (Choi, DiNitto, and Marti 2018a).

Similar to previous research (Pickard et al. 2020), those referred by courts/criminal justice system were more likely to complete treatment than self- or other individual referrals in all three treatment settings, likely due to the consequences of not completing treatment. Healthcare provider referrals were less likely to complete residential rehabilitation and outpatient treatment, even though healthcare providers were likely to have made referrals based on the seriousness of physical and mental health problems. On the other hand, referrals from substance use treatment providers had a higher likelihood of residential rehabilitation and outpatient treatment completion, suggesting that these referrals may have included individuals who were already seeking treatment, an

indication of motivation for addressing substance use disorders. Our findings differ from a previous study (Sahker, Schultz, and Arndt 2015) that found increasing rates of referrals from healthcare providers for older adults, as we found no difference in these referrals by age group and treatment setting. Lower odds of treatment completion among those with psychiatric problems in all three treatment settings and lower odds of residential rehabilitation and outpatient treatment completion among non-Hispanic Blacks and those who are homeless are in line with prior study findings (Morse et al. 2015; Stahler, Mennis, and DuCette 2016).

There were several additional findings. First, discharges who had one or more previous treatment episodes (indicators of more severe problems) had higher odds of completing residential treatment but lower odds of completing detoxification and outpatient treatment. Second, younger marijuana initiation age mitigates against older marijuana users completing any type of treatment and indicates that these individuals need special help to follow through with treatment. Third, regional differences showing that the Northeast had the highest rate of treatment completion need further examination to identify what might set this region apart from the rest of the country. Last, given the high rate of heroin/other opiate use problems, those with planned medication-assisted therapy also need help to remain in treatment.

Though TEDS-D is the largest data set on treatment discharges, generalizability of the findings is limited. First, TEDS-D includes only publicly supported treatment programs, leaving out those who received treatment from private sources and are likely to have more financial resources. Second, each state may have different methods and procedures for collecting data from treatment programs, which may have led to differing definitions of discharge status (e.g., transfer vs. termination by the program) and may explain the large amounts of missing data (e.g., psychiatric problems). More uniform and detailed data are needed to identify characteristics associated with discharge status. Third, since TEDS-D cases are discharges, not individuals, potential duplication/overestimation of polysubstance misuse problems and their effects is likely, although we controlled for prior treatment episodes in logistic regression models.

Despite these limitations, the findings underscore the importance of making more concerted efforts to help older adults who enter treatment for marijuana use problems, whether or not they have other substance use problems. First, those entering residential rehabilitation and outpatient services need help to

complete their course of treatment. A study found that residential substance use treatment retention (versus dropout) was predicted by higher distress tolerance interacting with external circumstances, internal motivation, and readiness to treatment (Ali et al. 2017). Those who do not complete treatment may continue to face multiple environmental and personal barriers to treatment and are more likely to continue to misuse or abuse substances. Similar to treatment adherence and relapse among those with other chronic illnesses such as diabetes mellitus, hypertension, and asthma, people with drug use disorders may also require more than one course of treatment before sustaining remission (McLellan et al. 2000). One mixed methods study of older adults (aged 50+) in residential alcohol treatment centers also found that they were not comfortable with mixed-age programming as some activities were not age-appropriate (e.g., too physically demanding), and they felt intimidated and subjected to ageist language and attitudes (Wadd and Dutton 2018). Researchers and treatment providers should investigate whether age-appropriate programming increases completion of residential rehabilitation programs. Since little research has been conducted with older adults in outpatient treatment, investigation is needed to identify strategies to improve retention and completion in these settings.

Second, lower treatment completion among those with psychiatric problems points to the need for combined substance abuse and mental health treatment. Third, lower residential rehabilitation and outpatient treatment completion odds among racial/ethnic minority older adults and lower residential rehabilitation completion odds among women also underscore the need to make programs culturally relevant and gender-specific and to alleviate barriers to remaining in and completing treatment. Fourth, despite the growing numbers of older adults with marijuana and other substance abuse problems, research on their treatment needs and effective treatments is scant. Research on these topics should be a priority.

Disclosure statement

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