

Patterns of illicit drug use and retention in a methadone program: A longitudinal study

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ABSTRACT

Objective: This study aimed to analyze illicit drug use of participants in a methadone treatment program in relation to methadone dose, counseling, and retention.

Methods: This was a longitudinal study of a cohort of 204 heroin-dependent subjects admitted for the first time to a methadone program in Stockholm. The patients were admitted between 1995 and mid-2000 and were followed until December 2000 or discharge. Up to June 11, 1998, individual psychosocial counseling was provided; after this date individual counseling was replaced with group counseling. Clinical data were collected from patient records and from a laboratory database. Rates of drug-positive urine analyses during different time periods were measured.

Results: The mean observation time was 2.5 years for all patients. The one-year retention rate was 84 percent, and the two-year rate was 65 percent, with no major differences between the two counseling groups. Almost all patients relapsed to illicit drug use. Discharged patients had a significantly higher rate of positive urine samples (21 percent versus 9 percent) than patients who remained in treatment. Also, low methadone dose and younger age predicted discharge from treatment.

Conclusion: The frequent urine monitoring showed that illicit drug use was rather common, even in a program with structured psychosocial interventions, although it was lower than in other studies. This testing policy can be used for early identification of patients at risk for drop-out or discharge who should be offered complementary interventions.

Key words: methadone maintenance treatment, urine samples, drug abuse patterns, discharge, drug abuse, methadone dose

INTRODUCTION

Methadone maintenance treatment (MMT), generally used in combination with psychosocial services, is a well-documented treatment for opiate addicts. It offers a number of reported positive effects, such as reduced opiate and other illicit drug use,^{1,2} decreased risk for needle sharing and HIV transmission,^{1,3-5} reduced risk of premature death,⁶ reduced criminal behavior,⁷ improved quality of life,⁸ social rehabilitation, and reduced costs for society.^{1,2,5,9,10} Illicit drug use is one of the most common reasons for clients' leaving MMT prematurely¹¹ and is related to the methadone dose¹² and level of psychosocial services^{1,13} provided. Moolchan and Hoffmann¹⁴ proposed a four-phase model with successively decreasing treatment interventions in relation to increased performance. The question of whether the impact of group-based counseling differs from that of individual counseling warrants study.

Information about illicit drug use during MMT can be obtained through interviews alone^{1,15} or in combination with urine drug screening.^{16,17} However, the validity of interview data is uncertain, as patient reports may be influenced by recall difficulties and perceived risk of negative sanctions if illicit drug use is exposed.^{18,19} Magura and Lipton²⁰ concluded that urinalysis is the most objective measure for evaluating patients' illicit drug use, as well as for making clinical decisions during treatment. Studies employing data from both interviews and urine testing have focused on changes in illicit drug use during treatment periods shorter than one year.^{16,17}

The Methadone Maintenance Treatment Programmes (MMTP) in Sweden were regulated by the National Board of Health and Welfare,²¹ in accordance with Dole and Nyswander's initial model, until January 2005. The national goal of a drug-free society led to close scrutiny of MMTP,

and the maximum number of patients allowed in the treatment programs at the same time was limited (500 patients 1994 through 1996,²² 600 patients 1997 through 1998,²³ 800 patients 1999 through 2003,²⁴ and 1200 in 2004²⁵). The inclusion criteria were a minimum of four years of addiction involving compulsive intravenous opiate use, an age of at least 20 years, failed individual rehabilitation by drug-free treatment, absence of advanced polydrug use, and the patient's free choice to enter the program.²¹ The two-year retention rate was 80 percent for all 655 patients in MMTP in Sweden until 1993, which is markedly higher than in most other reported studies.²⁶

The Stockholm MMTP expanded from 100 patients in 1988 to 271 patients in 1994, to 310 patients in 2000. After detoxification, MMT was initiated in ward or at the outpatient clinic and, at least during the following three months, supervised daily intake of methadone and routine urine sampling were obligatory. Approximately every second urine specimen was selected for laboratory analysis. The methadone dose was increased for all patients—up to 50 to 60 mg—during the first three months; after this point doses were individually adjusted (usually increased) if a patient reported withdrawal symptoms and/or if the plasma methadone concentration was lower than 200 to 400 ng/ml.²⁷ If the patient used illicit drugs, a drug-free period of four weeks was demanded before dose adjustment. A positive urine sample resulted in daily testing until a negative sample was produced. If the rehabilitation progressed positively, urine sampling became more infrequent (usually two to four times a month), take-home doses were allowed, and psychosocial services were gradually decreased. Decisions regarding involuntary discharge were made after discussion and evaluation of the patients' treatment performance and potential to benefit from further treatment. The criteria for inevitable involuntary discharge were threat of violence, criminal acts leading to a prison sentence, drug dealing, providing or smuggling narcotic substances and/or methadone, tampering with a urine specimen, and, from 1997 on, not taking methadone according to prescription.

MMTP thus made use of frequent monitoring of illicit drug use through urine testing. The existence of well-documented data about urine test results, methadone doses, and discharges dating back to 1995 permitted a more detailed analysis of illicit drug use during MMT than reported in other studies, and this is the rationale for this report. The aim of this study was to analyze the following:

- frequency and patterns of illicit drug use and its relation to gender and methadone dose;
- whether discharged patients have different patterns of illicit drug use than those remaining in treatment, especially early in treatment;

- whether initial individual or group counseling is related to illicit drug use, methadone dose, and retention; and
- the roles of illicit drug use and age at discharge.

The study was approved by the Research Ethical Committee at Karolinska Institutet on November 5, 2001 (Dnr: 01-310).

METHODS

During the period from January 1, 1995, to June 30, 2000, 225 heroin-dependent subjects with no prior experience with MMT were admitted to MMTP. This study is based on 204 of these patients, as 21 were excluded because of transfer to another MMTP (six subjects), lack of urinalysis results (four), or no participation in "The New Team" (11 subjects). The subjects were followed until December 31, 2000. The observation period ranged from six months to six years.

The psychosocial intervention was based on structured individual counseling (here referred to as "The Old Team") until June 1998, when a more structured group treatment program was introduced (here referred to as "The New Team") based on Moolchan and Hoffman's¹⁴ model, with mandatory activities for about 15 hours each week during the first three months or until negative urine samples were obtained. After this first treatment phase, patients were transferred to one of four other outpatient clinics for continued treatment based on individual counseling, urine screening, and cooperation with the social service agencies.

Data collection

Information about illicit drug use was obtained from the laboratory database. The exception was alcohol consumption, regarding which we lacked sufficiently detailed information. The urine samples were analyzed using routine immunochemical screening methods for methadone, opiates, benzodiazepines, amphetamines, cocaine, cannabis, barbiturates, LSD, and propoxyphene. Confirmation analyses by gas chromatography and mass spectrometry were undertaken if a positive screening result was refuted by the patient; these tests were performed in about 10 percent of all positive cases. The number of urine samples analyzed per person was 122 during the first year and decreased successively over time to 55 during the fifth year for patients with at least four years of treatment. Positive test results were grouped into relapse periods, each consisting of one or more sequential positive results and ending with the first negative result. All data concerning time in treatment, methadone dose, reasons for discharge, and patient characteristics were abstracted from patient records.

Statistical analysis

This study includes nearly all first-time patients admitted to MMTP during the study period. The power is 100 percent when we look at illicit drug use in relation to treatment status, but power has not been calculated for other analyses, as the numbers of patients are too low in the subgroups. Statistical analysis of illicit drug use during different periods after entry into MMTP was performed for all positive urine samples combined and separately for opiates, amphetamines, benzodiazepines, and cannabis. The differences were analyzed by χ^2 test. Results were considered significant for $p < 0.05$. Poisson regression was used to adjust for differences in follow-up time among subjects when calculating the number of relapse periods in relation to time at risk (time with drug abuse excluded). The incidence rate (number of relapse periods per person and year) was calculated as the total number of relapses divided by the total time in treatment for all persons during relevant time periods.²⁸ The relationships between illicit drug use and methadone dose, gender, age, and initial psychosocial treatment were compared for subjects who were in treatment on December 31, 2000, and for those who were discharged before the end of the study period. The Wilcoxon signed-rank test and Spearman rank-order correlations were calculated for bivariate correlations. The last adjusted methadone dose before three and six months in treatment, at one year, at 435 days (representing the median time in treatment for the 84 discharged patients), and each following year were compared between the patients in treatment and those who were discharged. The relative risk for relapse to drug use for the discharged patients in comparison to those in treatment was calculated from the incidence of relapse periods for each group. SAS software packet 9.0 was used for data analysis.

RESULTS

Subjects

The study cohort comprised 147 men (72 percent) and 57 women (28 percent). The median age at admission was 36 years (range of 21 to 66 years) for the men and 34 years (range of 24 to 50 years) for the women. The majority (54 percent) of patients had nine years or less of schooling, and only 5 percent had studied at a university. All patients had been detoxified in inpatient care at least once, and 40 percent more than 10 times. The mean number of prior residential treatment episodes was 2.4. At admission, 74 percent of patients were unemployed, 22 percent were receiving disability pension or were sick-listed, and 4 percent were employed, self-employed, or students. The mean number of years of intravenous opiate

use was 11, and use of other illicit drugs had usually occurred for several years.

Mean observation time and retention

Of the 204 patients, 120 patients (89 men, 31 women) remained in treatment and were followed until December 31, 2000, and 84 patients (58 men, 26 women) were followed until discharge. The mean time in treatment was 869 days (2.4 years) for all patients, 1,084 days (3 years) for patients who remained in treatment, and 561 days (1.5 years) for discharged patients. Two patients were discharged during the first three months. The one-year retention rate was 84 percent. The discharged patients were significantly younger (median age of 33 years; $p < 0.05$) than the patients who remained in treatment (median age of 37 years).

Results from urine screening

Illicit drug use was detected at least once in 13 percent (5,666) of 45,431 analyzed urine samples, corresponding to 3 percent of all 231,073 drug analyses (some tests did not involve all nine substances). Discharged patients had a significantly higher rate of positive urine samples (21 percent versus 9 percent) than patients who remained in treatment. Only nine of all 204 patients had no positive tests. Of all positive urine samples, 50 percent were positive for opiates, 49 percent for benzodiazepines, 16 percent for amphetamines, 8 percent for cannabis, and 2 percent for cocaine. There was no gender difference.

Illicit drug use after entry

The total number of relapse periods was higher for those who were discharged during all time periods. During the first three months, 51 percent (104 patients) of all 204 patients relapsed at least once; this value represents 47 percent (56) of the 120 patients in treatment and 57 percent (48) of the 84 discharged patients, resulting in a nonsignificant difference ($p = 0.14$). Figure 1 shows that 78 percent (81) of the 104 patients had at least one urine sample positive for opiates; 43 percent (45) had taken benzodiazepines, 20 percent (21) amphetamines, 9 percent (9) cannabis, and only 2 percent cocaine. Illicit use of amphetamines was significantly more frequent in the discharged group (31 percent, or 15 patients) than among those who remained in treatment (11 percent, or six patients; $p < 0.01$).

About 12 percent (24) of the 204 patients left urine samples that were positive for both opiates and benzodiazepines, but there was no significant relationship between these results and discharge ($p = 0.35$). The mean number of relapse periods per person during the first three months of treatment was 4.6 for discharged patients, compared to 3.4 per person and year among patients in treatment at the end of the observation period

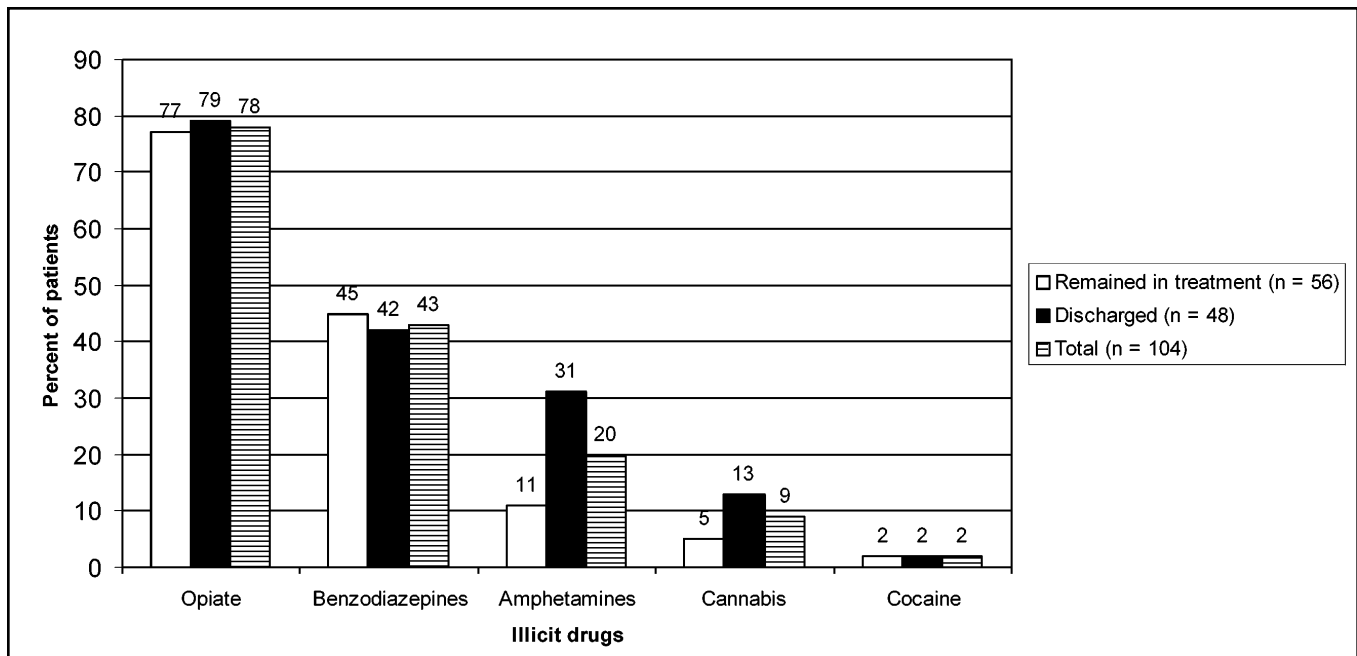


Figure 1. Percent of patients with relapse (n = 104) to various drugs during the first three months of treatment.

($p = 0.02$); in this area there was a statistically significant difference for men ($p = 0.04$) but not for women. Discharged patients also had significantly more relapse periods per person and year during the first six months and each year thereafter (up to and including the third to fourth years: $p < 0.0001$; fourth to fifth years: $p = 0.05$) (Table 1).

The overall relative risk for illicit drug use for patients who were discharged was 2.3 (95 percent CI 2.0 to 2.4) in comparison to those who remained in treatment; for men the risk was 2.2 (95 percent CI 2.0 to 2.4) and for women 2.9 (95 percent CI 2.5 to 3.5). The relapse rate among discharged patients decreased with longer treatment periods for both groups with regard to opiates, cannabis, and amphetamines, but not for benzodiazepines (Table 2).

Methadone dose in relation to relapse with opiates and retention

The rate of relapse to opiates during the observation period was negatively associated at the last adjusted methadone dose ($r = -0.22$; $p < 0.05$) and also at 435 days of treatment ($r = -0.19$; $p < 0.05$). The mean last adjusted dose was significantly lower for discharged patients than for those who remained in treatment: 63 versus 67 mg at three months ($p < 0.05$), 70 versus 76 mg at six months ($p < 0.0001$), 75 versus 84 mg at one year ($p < 0.0001$), and 81 versus 87 mg at two years of treatment ($p < 0.05$).

Association between counseling, illicit drug use, and methadone dose

Of the 204 patients, 131 (93 men and 38 women) were

admitted to The Old Team (through June 11, 1998) and 73 (54 men and 19 women) to The New Team (from June 12, 1998, to June 30, 2000). Overall, men and women from The Old Team had significantly more relapse periods than those from The New Team for the first two years of treatment ($p < 0.0001$). The number of relapse periods per person per year for patients in The Old Team was 5.9, versus 4.4 for patients in The New Team, and 8.4 versus 7.3 for discharged patients from the two teams, respectively. The last methadone dose before the end of the first year of treatment was significantly higher in The New Team than in The Old Team (83 mg versus 77 mg; $p = 0.0052$), especially among men (83 mg versus 75 mg; $p = 0.0006$), which may account for some of these differences. The one- and two-year retention rates were 85 and 66 percent in The Old Team and 83 and 63 percent in The New Team.

Reasons for involuntary discharge

Thirty-eight of the 84 involuntarily discharged patients (45 percent) were discharged because of illicit drug use, mostly in combination with some other discharge criteria. They had an average of 7.1 relapse periods per person per year, versus 6.6 for those who were discharged for other reasons ($p = 0.23$). About 30 percent of the discharged patients were women—the same proportion of females as in the entire study population. The proportion of discharged patients declined with age; 55 percent of patients ≤ 30 years of age were discharged, versus 23 percent of patients ≥ 41 years of age.

Table 1. Number of relapse periods per person and year among patients who remained in treatment (Tx) or were discharged (Dis)

	Time in treatment												
	0 to 6 months		6 to 12 months		1 to 2 years		2 to 3 years		3 to 4 years		4 to 5 years		5 to 6 years
Observation period	Tx (n = 1)	Dis (n = 14)	Tx (n = 14)	Dis (n = 20)	Tx (n = 25)	Dis (n = 29)	Tx (n = 24)	Dis (n = 10)	Tx (n = 25)	Dis (n = 7)	Tx (n = 13)	Dis (n = 4)	Tx (n = 18)
0 to 6 months	2.0	8.8	3.6	6.5	2.5	3.9	4.4	6.0	4.6	5.4	2.9	5.0	3.0
6 to 12 months			3.6	7.8	4.4	6.0	3.2	7.6	2.8	4.9	4.9	7.5	3.1
1 to 2 years					6.0	8.8	2.5	7.4	3.9	8.0	2.7	5.3	4.2
2 to 3 years							3.0	6.6	2.0	6.6	3.9	8.0	3.3
3 to 4 years									2.2	6.9	1.6	7.8	2.3
4 to 5 years											1.7	4.3	2.2
5 to 6 years													1.3

DISCUSSION

No other reports seem to exist about MMT programs utilizing such frequent urine analyses. Most of the patients left at least one positive urine sample, and almost all patients relapsed to opiates, but of the total taken only 13 percent of the urine samples were positive. In a study by Saxon et al.,²⁹ 40 percent of urine samples collected weekly during an 18-month period were positive for opiates; about 38 percent were positive for cocaine, 7 percent for benzodiazepines, and about 30 percent each for propoxyphene, barbiturates, and amphetamines. These percentages are much higher than in our study, but the mean methadone dose was lower in the Saxon et al. study. It was expected that discharged patients would have a significantly higher rate of positive urine samples than patients who remained in treatment (21 percent versus 9 percent), as this is a common reason for discharge. At the same time, the analyses show that patients with (even repeated) illicit drug use during treatment can stay in treatment after an overall assessment of their situation. This is contrary to a belief expressed in a sometimes polarized discussion of MMT in Sweden and in the past has been seen as controversial.

The policy of urine screening remained unchanged. A limitation of the study is the decreasing number of urine specimens with time in treatment.³⁰ We do not know whether we would have found a higher level of drug use with more frequent urine testing or with complementary self-reports. A combination of the two methods is considered to be more effective than either method used alone.³¹⁻³³ The 120 patients in treatment at the end of the study period had begun treatment with histories of significantly less drug abuse, and their lower rates of abuse persisted during all observation periods in comparison to the 84 discharged patients. Although relapses occurred late in treatment as in other studies,¹ the relapse periods decreased with time in treatment.^{1,34} Patients yielding the most frequent positive urine samples were discharged first, as in the study by Morral et al.¹⁷ All but two patients remained in treatment during the first three months. This differs from several other studies where about 30 percent, if not more, left treatment during this period.³⁵⁻³⁸ The high retention rate seen in this study may be related to strict admission criteria, a long admission procedure including social and medical treatment planning, and time spent on a waiting list; this combination of factors has probably led

Table 2. Number of relapse periods per person and year to specific drugs among patients who remained in treatment (Tx) or were discharged (Dis)

	Time in treatment (years)					
	0 to 1		1 to 2		2 to 3	
Type of drug	Tx (n = 15)	Dis (n = 34)	Tx (n = 25)	Dis (n = 29)	Tx (n = 24)	Dis (n = 10)
Opiates	2.8	5.0	2.0	4.0	1.5	3.5
Benzodiazepines	1.1	3.4	2.0	4.0	1.5	4.1
Cannabis	0.0	0.7	0.0	0.3	0.0	0.2
Amphetamines	0.8	1.9	1.3	1.8	0.5	1.5

to priority being given to subjects with higher motivation, as well as to a high perceived risk of involuntary discharge following positive urine tests. The retention rate could also be related to methadone dose, medical or psychosocial treatment, and social interventions such as the availability of lodging in a boarding house.

The patients often used benzodiazepines, a finding reported in other studies.^{39,40} This was more common in the discharged group and may be due to a generally more dysfunctional life,³⁹ a greater need to reduce withdrawal from or enhance the effect of the primary drug,⁴¹ and/or benzodiazepine dependence.⁴² Amphetamine use was significantly related to discharge even during the first three months, especially for men. Bykvist,⁴³ in a study of polydrug use among Swedish drug abusers in the early 1980s, found that amphetamines and cannabis were the most common second-choice drugs for drug users whose primary drugs were opiates (benzodiazepines were not included in the study). The discharged patients were about six times more likely to use cannabis during treatment than those who remained in treatment. We found a negative relationship between methadone dose and opiate relapse, which corresponds with earlier research.^{1,44-46} The discharged patients had lower methadone doses, possibly due to a delayed increase in methadone dose because of illicit drug abuse, leaving treatment because of withdrawal symptoms, or dissatisfaction with the methadone dose level. Hiltunen et al.²⁷ found that dissatisfied patients who received a dose increase stopped their illicit drug use. This poses the question of whether the schedules for reaching stabilization levels and the policy for adjusting methadone doses were sufficiently adapted to individual needs. We also must question whether a delayed dose increase due to positive urine tests increased the risk of relapse and involuntary discharge. The lower relapse rate among the patients in The

New Team compared to patients in The Old Team is probably partly due to significantly higher methadone doses during the first year, but it could also be due to the stricter deterrent policy of discharge after two positive urine samples. During the first three months, the levels of attendance and counseling were high in both teams, and we feel these are important predictors of treatment retention.³⁸ Åberg et al.⁴⁷ reported that Swedish methadone patients considered psychosocial interventions very important. No differences in retention rates were observed between the two teams, which suggests that the level of counseling in both teams contributed equally well to retention. Illicit drug use was the most frequent administrative reason for discharge, which corresponds to the results of other Swedish studies.^{26,48} In other countries, loss of contact, loitering, noncompliance with program rules, voluntary drop-out, arrest, and incarceration seem to be more common reasons for discharge^{1,37,49}; these outcomes may be explained by different program policies.

CONCLUSION

The generality of this study is limited with regard to methadone programs with less restrictive admission criteria. Although the subjects in this study had long histories of drug abuse, the retention rates were high. Almost all patients relapsed into illicit drug use at least once, but the proportion of positive urine tests was low, although comparisons with other programs are difficult due to their lower rates of urine testing. Illicit drug use decreased during the follow-up period but was the most frequent reason for discharge. Methadone dose was related to illicit drug use and discharge, and there is some question as to whether the policy of not increasing the methadone dose in patients with a positive urine sample contributed to further relapse

and involuntary discharge. Further research is needed to identify factors that reduce the risk for illicit drug use during treatment and to develop ways of using this knowledge to improve treatment and to better adapt it to individual needs.

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