



## Factors predicting retention in treatment: 10-year experience of a methadone maintenance treatment (MMT) clinic in Israel

Einat Peles<sup>a,\*</sup>, Shaul Schreiber<sup>a,b</sup>, Miriam Adelson<sup>a</sup>

<sup>a</sup> *Dr. Miriam & Sheldon G. Adelson Clinic for Drug Abuse, Treatment & Research, Tel-Aviv Elias Sourasky Medical Center, 6 Weizman Street, 64239 Tel-Aviv, Israel*

<sup>b</sup> *Department of Psychiatry, Tel Aviv Sourasky Medical Center (affiliated to the Sackler Faculty of Medicine Tel-Aviv University), Tel-Aviv, Israel*

Received 9 July 2005; received in revised form 20 September 2005; accepted 20 September 2005

### Abstract

The aims were to identify predictors of treatment retention in an Israeli methadone maintenance treatment (MMT) clinic, and to compare the findings to other international settings. We prospectively studied 492 patients admitted since 1993 through 10 years to an Israeli MMT clinic associated with a university-affiliated tertiary care medical center. Analyses (Kaplan Meier and Cox regression) included methadone dose and urinalysis results (for methadone, cocaine, opiates, benzodiazepines, THC, amphetamines) of each patient in the first month and after 1 year in treatment (or during the last month if the stay was >3 months and <1 year) and patients' characteristics (modified ASI). The 1-year retention rate was 74.4%; 65.8% stopped opiate abuse after 1 year in treatment. On admission, 13.6% of patients had used cocaine: there was a net decrease of 61.6% after 1 year. Factors predicting prolonged retention in MMT treatment (Cox regression) were daily methadone dose of 100 mg or greater, negative urine for opiates after 1 year, and being a parent on admission. We conclude that our good outcome results (high rate of retention after 1 year (74.4%), high proportion of opiate abuse cessation (65.8%), and net reduction in cocaine abuse, similar to normal standards in other MMT clinics elsewhere in the world, justify the expansion of the MMT clinic network in Israel in order to make treatment available to all those who need it. A protocol favoring higher methadone dosage as appropriate is recommended.

© 2005 Elsevier Ireland Ltd. All rights reserved.

**Keywords:** Methadone maintenance treatment; Kaplan Meier survival analyses; Retention; Predictors

### 1. Introduction

Methadone maintenance treatment (MMT) is the most effective pharmacotherapy for heroin addiction (Dole et al., 1966; NIH Consensus Statement, 1997). Good MMT programs include psychosocial as well as medical therapy, the importance and contribution of which are well established for therapeutic success (McLellan et al., 1993). In Israel, MMT has been available with various restrictions for opiate-dependent patients since 1973. The Israeli Ministry of Health decreed in 1992 that all MMT clinics should be under the jurisdiction of the Ministry, and that only medical doctors associated with these clinics are permitted by law to prescribe methadone. There are 10 MMT clinics in Israel: 8 are located in community settings while the 1 reported here (established on 25 June 1993) is located within a large, municipi-

pal, university-affiliated medical center. It is estimated that there are approximately 20,000 heroin addicts in Israel (Israel Anti-drug Authority, 2004) of whom only about 3000 (approximately 15%) are receiving MMT.

In the United States, 170,000 of the estimated 810,000 opioid-dependent individuals (~21%) are in MMT programs (Office of National Drug Control Policy, 1999). The guidelines for conducting MMT programs in Israel were adopted from those used in the US (detailed in Adelson et al., 2000).

MMT programs are generally similar worldwide. Nevertheless, the patients' characteristics, the levels of drug abuse and the rates of hepatitis C and HIV infection are reported to be higher in the US compared with the Israeli patient population. Therefore, 10 years after its establishment, as was done 4 years after its inauguration (Adelson et al., 2000), outcomes for the present program were examined. Since no accurate data on 1-year retention rates and drug abuse in other Israeli MMT clinics are available (Adelson et al., 2000; Bleich et al., 2002; Weizman et al., 2004), it is assumed that the present clinic is representative

\* Corresponding author. Tel.: +972 369 732 26; fax: +972 369 738 22.  
E-mail address: [einatp@tasmc.health.gov.il](mailto:einatp@tasmc.health.gov.il) (E. Peles).

of all the MMT clinics throughout the country. The current report describes the results of an in-depth evaluation of the outcome of all patients admitted to the present MMT clinic during its first 10 years of operation by

- evaluating retention in treatment after 1 year and cumulative retention up to 11 years;
- evaluating discontinuation of drug abuse;
- characterizing methadone dose;
- identifying variables that predicted retention in treatment.

## 2. Methods

### 2.1. Study population

A total of 492 patients >18 years of age were admitted to the MMT clinic between its establishment on 25 June 1993 and the closure of this study on 24 June 2003. They met criteria similar to those of the US Federal Regulations for entering methadone treatment (i.e., DSM-IV criteria of dependence on multi-self-administrations of heroin for 1 year or more) at admission, and arrived to the MMT clinic either on their own or via referral from the affiliated hospital's wards or emergency room. On admission, each patient read and signed the policy of the clinic, which is in full accordance with the Israeli Ministry of Health guidelines. In brief, each patient drinks the individual methadone dose every day in the clinic, and attends regular appointments with a personal therapist (i.e., a social worker, a clinical criminologist, a physician, and a psychiatrist), as well as diverse therapy groups (focusing on themes such as women's issues, cocaine use, violence, and 12-steps). A patient may accumulate "rights" (up to 14 "take-home" doses of medication), if he/she stops illicit drug use and presents acceptable behavior. Violent behavior or selling drugs within the clinic may result in immediate discontinuation of treatment. Patients are required to pay for treatment (around 70 US\$ per month), and are asked to undergo periodic (once a year) blood tests for infectious disease (hepatitis C (HCV), HIV antibodies and HBV antigens, VDRL), X-ray for tuberculosis, and recently electrocardiography (ECG). Demographic data were collected from the patient's charts that routinely include a modified ASI questionnaire (McLellan et al., 1984).

### 2.2. Capacity of the clinic

There were 71 patients in treatment by the end of the clinic's first year, and the number gradually increased to 319 by the end of the ninth year (the clinic's full capacity is 300 patients).

### 2.3. Urine toxicology and methadone

At least one randomized observed urine test per week (range 1–11 per month, mean four samples per month [one sample per week]) was provided by each patient throughout his/her entire course of treatment (range 1 day–10.8 years). All urine samples were analyzed for opiates, methadone, cocaine metabolite (benzoylecgonine), benzodiazepines (BDZ), cannabis (THC), methadone (up to 2002) or its metabolite (since 2002) and

amphetamines, using enzyme immunoassay systems (DRI<sup>®</sup> for the first 6 and CEDIA<sup>®</sup> for the last 2) (Hawks, 1986). A patient was classified as being "positive" on admission if at least one urine sample for the drug was positive during the first month of treatment. For patients who remained in treatment for at least 13 months (Group A), at the completion of 1 year of treatment the patient was defined as being "positive" for a drug if there had been at least one positive urine screen for that drug during month 13 (Group A).

For patients who remained in treatment for 4 months or more but less than 13 months (Group B), illicit drug use during the last month in treatment was recorded. Methadone dose was recorded daily, and the doses administered at the beginning of month 13 were recorded for Group A and at the beginning of the last month in treatment for Group B. Patients ( $n = 50$ ) who left MMT before 4 months had elapsed, were excluded from the analyses used for compiling cumulative retention to be sure that methadone dose during the last month was a stabilized one and not a temporary midway dose during the stabilization process. Sixty-five of the 492 patients (13.2%) had more than one admission, however, the data for all analyses were taken from each patient's first admission.

### 2.4. Statistical analyses

Proportional differences between groups were analyzed by the Chi-square or Fisher's Exact test. Pearson Chi-square test was applied for evaluating significant trends. The methadone dose and other continuous variables were analyzed for significant differences using the analysis of variance (ANOVA). The number of days in clinic from first admission until the patient quit treatment or until the end of follow-up (11 years) was taken for calculating cumulative retention in treatment using survival analyses (Kaplan Meier) with log-rank. To evaluate the time effect, patients were divided into those admitted during the early period (1993–1997) or in the late period (1998–2003) of the study. Variables that were significantly associated with retention in the Kaplan Meier analyses ( $p < 0.05$ ) were included in the Cox regression multivariate analyses and presented in odds ratio (OR) and 95% confidence interval. All analyses were done using the SPSS-12 package.

## 3. Results

### 3.1. Socio-demographic characteristics

The patients' characteristics are detailed in Table 1. The number of newly admitted patients varied between the years (16 patients in 1999 and 78 patients in 2002). The majority of patients were males (72.8% compared to 27.2% females). Their mean age on admission was  $36.7 \pm 8.5$  years (range 18–67 years) and their reported mean age at the start of opiate abuse was  $23 \pm 7.4$  years. The mean interval between starting opiates and entering MMT was  $13.8 \pm 8.3$  years (these data were missing in 24 patients). Over one-third ( $n = 181$ , 36.8%) of the total number of patients were immigrants (mostly from the former USSR:  $n = 109$ , 60.2%). Notably, 63.4% had at least one child when

Table 1  
Patients' characteristics and their relation to 1-year retention in treatment

	N (%) 492 (100)	Retention (%)	p-value (Fisher's Exact test)
Admission age groups			0.09
18–39 years	316 (64.2)	71.8	
≥40 years	176 (35.8)	79	
Gender			0.8
Male	358 (72.8)	74.0	
Female	134 (27.2)	75.4	
Place of birth**			1
Israel	307 (62.4)	74.9	
Immigrant	181 (36.8)	75.1	
Having children**			0.2
Yes	312 (63.4)	76.6	
No	177 (36.0)	71.8	
Marital status**			1
Couple	163 (33.1)	75.5	
Single	324 (65.9)	75.0	
Education years			0.5
<8 years	57 (11.6)	75.4	
8–11 years	262 (53.3)	80.9	
≥12 years	127 (25.8)	76.4	
Unknown	46 (9.3)		
Hepatitis C antibody			1
Yes	261 (53.0)	78.3	
No	198 (40.2)	78.5	
Unknown	33 (6.7)		
HIV antibody			0.1
Yes	36 (7.3)	72.2	
No	382 (77.6)	83.5	
Unknown	74 (15.0)		
Admission BDZ abuse**			0.4
Yes	272 (55.3)	76.5	
No	216 (43.9)	73.1	
Admission cocaine abuse**			0.2
Yes	67 (13.6)	82.1	
No	421 (85.6)	73.9	
Admission THC abuse**			0.3
Yes	55 (11.2)	81.8	
No	433 (88)	74.1	
Admission amphetamines abuse**			0.2
Yes	45 (9.1)	66.7	
No	443 (90)	75.8	
1-year opiate abuse***			<0.0005
Yes	179 (36.4)	69.8	
No	263 (53.5)	91.6	
1-year BDZ abuse***			0.005
Yes	218 (46.6)	77.7	
No	224 (44.5)	88.1	
1-year cocaine abuse***			0.03
Yes	62 (12.6)	72.6	
No	380 (77.2)	84.5	
Methadone dose after 1 year***			<0.0005
<100 mg/day	125 (25.4)	71.2	
≥100 mg/day	317 (64.4)	87.4	

(\*) Chi-square; (\*\*) less than 1% were unknown; (\*\*\*) excluding 50 (10.2%) patients who stayed <4 months.

admitted to the MMT. Tests for antibodies for hepatitis C were positive in 53%, and for HIV in 7.3% of the patients. Both HIV and hepatitis C antibodies were detected in 29 patients (data on at least one of the antibodies were missing in 84 patients).

### 3.2. Illicit drug abuse on admission

On admission, 55.3% of the 492 patients were positive for BDZ with an inverse linear trend from 60% in 1993 to 36.4% in 2003 (maximum 69.7% in 2002; Pearson Chi-square 18.4,  $p=0.05$ ), 13.6% were positive for cocaine with a linear trend from 0% in 1993 to 13.6% in 2003 (maximum 27% in 2001; Pearson Chi-square 41,  $p<0.0005$ ), 11.2% were positive for THC with no linear trend (range 0–19.2%; Pearson Chi-square 14.7,  $p=0.1$ ), and 9.1% were positive for amphetamines with an inverse linear trend from 28.6% to 13.6% (minimum 2.6% in 2002) through the 10-year study period (Pearson Chi-square 31.6,  $p<0.0005$ ).

### 3.3. Illicit drug abuse after 1 year in treatment

The retention in treatment for at least 1 year for all 492 study patients was 74.4% with a linear trend from 45.7% in 1993 to 90.9% in 2003 (Pearson Chi-square 22.7,  $p=0.01$ ). Of the patients who stayed in treatment for at least 1 year, 65.8% stopped using opioids with a variation ranging between 49.1% (in 1995) and 77.2% (in 2002) (Pearson Chi-square 14.8,  $p=0.1$ ). There was a net decrease in drug abuse (determined by the proportion of patients who were positive for a drug on admission and stopped after 1 year, minus the proportion of patients who started abusing a drug while in treatment and who had not abused that drug on admission): 61.6% for cocaine (70.9% [39/55] who stopped minus 9.3% [29/311] who started), 10.2% for BDZ (36.1% [75/208] who stopped minus 25.9% [41/158] who started), 43.2% for THC (57.8% [26/45] who stopped minus 14.6% [47/321] who started), and 75.3% for amphetamines (83.3% [25/30] who stopped minus 8% [27/336] who started).

The mean methadone dosage in the 366 patients who stayed in treatment for at least 1 year (Group A) was  $132.6 \pm 51.5$  mg/day, significantly higher than the dose recorded in the last month of the 76 patients who stayed in treatment for at least 4 months but dropped out before 1 year (Group B), i.e.,  $108.6 \pm 46.5$  mg/day (ANOVA  $F=14.2$ ,  $p<0.0005$ ). The mean methadone dose for all 442 analyzed patients was  $128.3 \pm 51.5$  mg/day, of which the dose was  $\geq 100$  mg/day for 317 (71.7%) of them. The methadone dose increased by year of admission (from  $90.7 \pm 39.1$  mg/day in 1993 to  $126 \pm 43.5$  mg/day in 2003, ANOVA corrected model  $F=15.7$ ,  $p<0.0005$ ) and was significantly higher consistently among the patients in Group A compared to those in Group B (ANOVA corrected model  $F=9.8$ ,  $p<0.0005$ ).

The variables that were significantly related to 1-year retention in treatment were discontinuation of drug abuse and the dose of methadone after 1 year in treatment (or at the last month of treatment for Group B patients). Specifically, no opiate abuse ( $p<0.0005$ ), no cocaine abuse ( $p=0.03$ ), no BDZ abuse ( $p=0.003$ ) and a methadone dose of  $\geq 100$  mg ( $p<0.0005$ ) significantly related to 1-year retention in treatment. The 1-year

Table 2  
Patient characteristics significantly associated with cumulative retention

	N (%)	Cumulative retention (Kaplan Meier)	
		Mean (95% CI) (year)	log-rank ( <i>p</i> -value)
	492 (100)		
Admission age groups			5.8 (0.02)
18–39 years	316 (64.2)	5 (4.4–5.5)	
≥40 years	176 (35.8)	5.9 (5.2–6.6)	
Having children (Fig. 3)			4.6 (0.03)
Yes	312 (63.4)	5.7 (5.2–6.2)	
No	177 (36)	4.7 (4–5.4)	
1-year Opiate abuse** (Fig. 1)			28.4 (<0.0005)
Yes	179 (36.4)	4.6 (4–5.3)	
No	263 (53.5)	6.7 (6.1–7.2)	
1-year BDZ abuse**			5.3 (0.02)
Yes	218 (46.6)	5.4 (4.8–6.1)	
No	224 (44.5)	6.4 (5.8–7)	
1-year Cocaine abuse**			5 (0.03)
Yes	62 (12.6)	4.6 (3.5–5.7)	
No	380 (77.2)	6 (5.6–6.5)	
1-year Methadone dose** (Fig. 2)			12.8 (0.0003)
<100 mg/day	125 (25.4)	4.7 (4–5.5)	
≥100 mg/day	317 (64.4)	6.3 (5.8–6.9)	

(\*) For each variable category, the mean and 95% confidence interval cumulative retention in treatment (Kaplan Meier) is presented in years, and the comparison between categories is presented by log-rank and significance (*p*-value); (\*\*) excluded 50 (10.2%) patients who stay <4 months.

retention rate was not significantly related to age at admission to MMT, gender, place of birth, having children, marital status, years of education, positive antibody to hepatitis C, positive antibody to HIV, and abuse of any drug on admission (Table 1).

### 3.4. Long-term retention in treatment

The cumulative retention in treatment was significantly longer in patients with no opiate abuse after 1 year (Table 2, Fig. 1), in patients with methadone doses of ≥100 mg after 1 year (Fig. 2), in patients with negative urine BDZ after 1 year, and in patients with negative urine samples for cocaine after 1 year. Cumulative longer retention in treatment was also found in patients who were ≥40 years of age on admission compared to those who were younger (Table 2). Although there was a significant correlation between age at admission and age at the onset of opiate abuse (Pearson  $R=0.45$   $p<0.0005$ ) as well as with the duration between starting opiates and starting MMT (Pearson  $R=0.6$   $p<0.0005$ ), cumulative retention was not significantly related to those variables. Patients who were already parents on admission had a significantly longer cumulative retention in treatment compared with patients with no children (Table 2, Fig. 3). The later was not related to age on admission although a higher proportion of the patients who had children were >40 years of age (46.5% versus 15.8% of patients with no children, Fisher's Exact test  $p<0.0005$ ).

The proportion of females having children (74.6%) was significantly higher than males (59.2%, Fisher's Exact test  $p=0.002$ ), however the cumulative retention was significantly longer in males having children (5.9 year, 95% CI 5.3–6.6) versus males with no children (4.6 year, 95% CI 3.9–5.4, log-rank

6.1,  $p=0.01$ ), with no significant difference between the females groups (with children 5.2 year, 95% CI 4.2–6.1 and without children 4.5 year, 95% CI 3–6,  $p=0.7$ ). Although most patients with steady partners had children (79.1%) compared with single patients (55.9%), the cumulative retention in treatment of the former group was not significantly different from the latter (data not shown). Cumulative retention in treatment was not significantly related to gender, years of education, place of birth, use

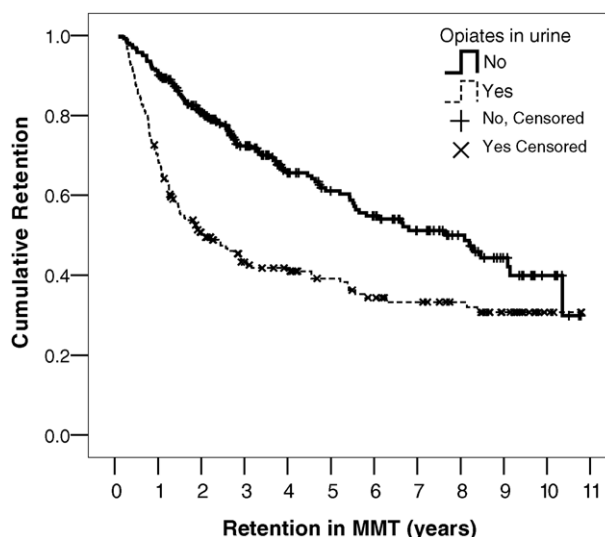


Fig. 1. The cumulative retention in treatment for patients with positive and negative urine samples for opiates after 1 year in Group A (or last month in treatment in Group B). Censored patients (those who did not left treatment, however still have not finished all 11 years of follow-up) for each group are marked.

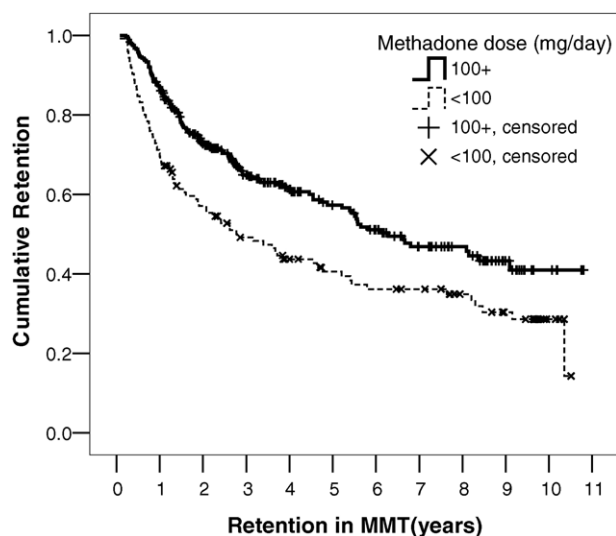


Fig. 2. The cumulative retention in treatment for patients with low (<100 mg/day) and high ( $\geq 100$  mg/day) methadone doses after 1 year in Group A (or last month in treatment in Group B). Censored patients (those who did not leave treatment, however still have not finished all 11 years of follow-up) for each group are marked.

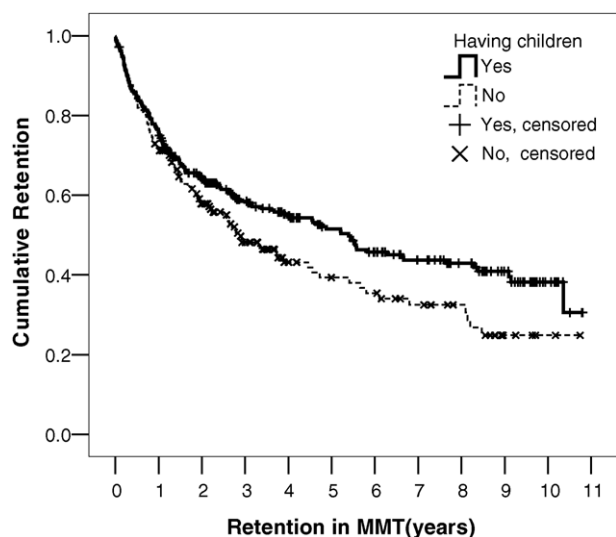


Fig. 3. The cumulative retention in treatment for patients having children and patients not having children on admission to MMT. Censored patients (those who did not leave treatment, however still have not finished all 11 years of follow-up) for each group are marked.

of any drug on admission or having antibodies to hepatitis C or HIV (data not shown). There was no significant effect of time on cumulative retention; specifically, identical cumulative retention curve lines of the two periods times “early” (1993–1997) and “late” (1998–2003) were observed (log-rank 0.1,  $p = 0.7$ ), despite the fact that a shorter mean retention was calculated for the late period group (3.8 year versus 5.2 year in the early period) since, by definition, they had only half the length of follow-up.

The predictors for long-term retention in treatment in the Cox regression multivariate analyses were no opiate abuse (OR = 2.0) and high methadone dose (OR = 1.9) after 1 year in treatment, and having children at the time of admission (OR = 1.4) (Chi-square 59,  $p < 0.0005$ ) (the interaction between gender and having children was not significant) (Table 3).

#### 4. Discussion

We adopted American standards for MMT when we first opened a MMT clinic in 1993. Throughout the ensuing 10 years, we accumulated data on the nature of the patient population, and found it to be somewhat different from that of the US, especially in the parameters of percent of immigrants, the presence of hepatitis C and HIV antibodies, and rates of cocaine abuse.

Overall, our clinic has a high rate of treatment retention at 1-year (74.4%) and a high rate of opiate abuse discontinuation (65.8%). From the perspective of a 1-year in treatment time-point, we also found a significant net reduction in other street- and prescription-drug abuse (such as cocaine, THC, BDZ and amphetamines). When we added survival analysis (that dealt with censored data and variations in event duration) to the analyses of the fixed 1-year cutoff, we found that the predictors for long-time retention (up to 11 years) were threefold: no opiates abuse and a high methadone dose ( $\geq 100$  mg/day) after 1 year of treatment (or in the last month in treatment for Group B) and patients being parents (multivariate analyses Cox model). Both methadone dose and no opiate abuse were in-treatment variables, while having children was the only pre-treatment baseline variable. The importance of in-treatment variables is supported by Magura et al. (1998), who demonstrated these variables as well as others (e.g., constructive clinic responses to patients’ problems) to retention outcome. They, however, observed in-treatment variables several times during the course of treatment, while in the current study it was checked at one time point for each patient (i.e., after 1 year in Group A or during the last month in treatment in Group B).

Table 3  
Cox regression analyses<sup>a</sup>

	B	S.E.	Wald	p-value	OR	95% CI for OR
Children (yes)	.307	.144	4.5	0.03	1.4	1.024 1.8
Age > 40 years	.251	.154	2.6	0.1	1.3	0.95 1.7
No opiates	.683	.148	21.2	<0.0005	2.0	1.5 2.6
No BDZ	.274	.154	3.2	0.08	1.3	0.97 1.8
No cocaine	.201	.191	1.1	0.3	1.2	0.8 1.8
Methadone $\geq 100$ mg/day	.667	.150	19.7	<0.0005	1.9	1.5 2.6

<sup>a</sup> Analyses included the 442 patients who stayed  $\geq 4$  month in MMT. Drug use (no opiates, no BDZ, no cocaine) is based on the urine results during month 13 in those who stayed 1 year (Group A) and in the last month of treatment in those who left before 1 year (Group B).

Our finding on the applicability of a high methadone dose to predict long-term retention replicates the experience of others (Maxwell and Shinderman, 2002; Faggiano et al., 2003). It should be noted, however, that the definition of “high dose” ( $\geq 100$  mg/day) used in the present study and by Maxwell and Shinderman’s (2002) is much higher than Faggiano et al.’s (2003), who defined it as being 60–100 mg/day or Strain et al.’s (1999) randomized controlled study that defined it as being 80–100 mg/day (and found that it led to a better outcome). Furthermore, findings from meta-analyses of 13 randomized controlled, double blind clinical trials which compared 890 patients with high doses ( $\geq 50$  mg) to 392 patients with low doses ( $< 50$  mg) (Farré et al., 2002) demonstrated the same trend. The meta-analyses, however, reported a better outcome with respect to discontinuation of opiates abuse, and did not reach significance with respect to retention. Thus, they might have found better retention in the  $\geq 100$  mg/day dose group. Magura et al. (1998) also found a higher dose of methadone to be associated with longer retention, even though they used a different method, and their study sample had a lower methadone dose than ours – 91% of their patients had methadone dose of  $\leq 80$  mg/day.

A second long-term retention predictor that emerged from our study as of others (Magura et al., 1998a, 1998b; Goldstein and Herrera, 1995) is the cessation of street-opiate abuse at 1 year. Contrary to Magura et al.’s (1998) finding that cocaine abuse during treatment was an even stronger predictor than opiate abuse, our results showed that cocaine abuse at 1 year was a predictor for long-term retention only in univariate analyses. The weak association that we found may have been derived from the overall low rate of cocaine abuse in our clinic (13.6% on admission), characteristic of the street-drug patterns of abuse in Israel, compared to Magura et al. (1998) sample of 15 clinics in New York City (above 40%). Cocaine on admission was not found to predict retention in treatment in this or other studies. This finding is very important because some MMT clinics in Israel (as elsewhere) do not accept patients abusing cocaine into treatment. Thus, these results taken together with our finding of a net reduction in cocaine abuse after 1 year show that patients who are abusing cocaine on admission can succeed and therefore should be accepted into MMT programs.

In contrast to a low rate of cocaine abuse, our patients had a high rate of BDZ abuse, both at admission and at 1 year. A 1-year no-BDZ-abuse was also found in the current study to be a predictor for long-term retention, but this emerged only in univariate analyses. Again and importantly, baseline (pre-treatment) BDZ abuse did not predict long-term outcome, but it was a positive predictor at the 1-year in-treatment point.

Of all the baseline (pre-treatment) variables, multivariate analyses revealed that being a parent was a positive predictor for long-term retention in MMT (in particular for males having children). To the best of our knowledge, exploration of this parameter – however intuitively probable – has not been reported in the literature as an independent predictor although it was found as predictor in univariate analyses by Magura et al. (1998). In addition, our univariate analyses once again confirmed the well-established predictor of “older age at admission” for retention in treatment: taken together, 46.5% of our

patients who had children were older than 40 years of age on admission, while only 15.8% of childless patients were older than 40 years of age. These figures suggest that, in the current cohort, being older and having children at admission was the strongest predictor for cumulative retention. We wish to emphasize that the pre-treatment variable of having children had no advantage for 1-year retention in treatment or any of the other pre-treatment variables: only the long-term follow-up revealed that this variable predicted long-term retention. Thus, only a high methadone dose and its effect on drug discontinuation contributed to the 1-year retention rate.

The small number of the HIV-positive patients precluded arriving at any conclusion regarding that parameter. The proportion of HIV-positive patients in other MMT clinics in Israel is lower than ours, since our clinic is located within a general hospital and those patients are accepted immediately, bypassing the long waiting list. Our clinic is representative, however, of other patient characteristics, such as prevalence of patients with positive antibody to HCV, age and gender distribution and proportion of immigrants. With respect to methadone treatment, the proportion of patients with a high methadone dose is higher in our clinic compared with the other clinics in Israel (Ministry of Health, personal communication).

Although the reported patients were admitted at different times, and several changes had taken place in our MMT clinic during the reported decade (i.e., increase in patient number in the clinic; increase in cocaine abuse, increase in methadone dosage) the cumulative retention was steady throughout the follow-up.

In conclusion, we found that our outcomes in an Israeli MMT are in agreement with those of other studies in other countries and emphasize that long-time retention is associated with three parameters: the first two, as reported by others, are a high methadone dose and the cessation of street-opiate abuse, and the third, which we believe has not been verified before, is that a patient is a parent. The results justify the expansion of the MMT clinic network in Israel in order to make treatment available to all those who need it.

## Acknowledgments

Many thanks to Esther Eshkol for editorial assistance. This research was supported by internal funds (M.A.).

## References

- Adelson, M.O., Hayward, R., Bodner, G., Bleich, A., Gelkopf, M., Kreek, M.J., 2000. Replication of an effective opiate addiction pharmacotherapeutic treatment model: minimal need for modification in a different country. *J. Maintenance Addict.* 1, 5–13.
- Bleich, A., Gelkopf, M., Weizman, T., Adelson, M., 2002. Benzodiazepine abuse in a methadone maintenance treatment clinic in Israel: characteristics and a pharmacotherapeutic approach. *Isr. J. Psychiatry Relat. Sci.* 39, 104–112.
- Dole, V.P., Nyswander, M.E., Kreek, M.J., 1966. Narcotic blockade—a medical technique for stopping heroin use by addicts. *Trans. Assoc. Am. Physicians* 79, 122–136.
- Faggiano, F., Vigna-Taglianti, F., Versino, E., Lemma, P., 2003. Methadone maintenance at different dosages for opioid dependence. *Cochrane Database Syst. Rev.*, CD002208.

- Farré, M., Mas, A., Torrens, M., Moreno, V., Camí, J., 2002. Retention rate and illicit opioid use during methadone maintenance interventions: a meta-analysis. *Drug Alcohol Depend.* 65, 283–290.
- Goldstein, A., Herrera, J., 1995. Heroin addicts and methadone treatment in Albuquerque: a 22-year follow-up. *Drug Alcohol Depend.* 40, 139–150.
- Hawks, R.L., 1986. Analytical methodology. *NIDA Res. Monogr.* 73, 30–42.
- Israel Anti-drug Authority update 6 July 2004, <http://www.antidrugs.gov.il/>.
- Magura, S., Kang, S.Y., Nwakeze, P.C., Demsky, S., 1998a. Temporal patterns of heroin and cocaine use among methadone patients. *Subst. Use Misuse* 33, 2441–2467.
- Magura, S., Nwakeze, P.C., Demsky, S.Y., 1998b. Pre- and in-treatment predictors of retention in methadone treatment using survival analysis. *Addiction* 93, 51–60.
- Maxwell, S., Shinderman, M.S., 2002. Optimizing long-term response to methadone maintenance treatment: a 152-week follow-up using higher-dose methadone. *J. Addict. Dis.* 21, 1–12.
- McLellan, A.T., Arndt, I.O., Metzger, D.S., Woody, G.E., O'Brien, C.P., 1993. The effects of psychosocial services in substance abuse treatment. *JAMA* 269, 1953–1959.
- McLellan, A.T., Luborsky, L., O'Brien, C.P., Barr, H.L., Evans, F., 1984. The Addiction Severity Index in three different populations. *NIDA Res. Monogr.* 55, 217–223.
- NIH Consensus Statement, 17–19 November 1997. *Effective Medical Treatment of Opiate Addiction*, vol. 15, p. 6.
- Office of National Drug Control Policy, March 1999. *Policy Paper-Opioid Agonist Treatment*. Executive Office of the President, Office of National Drug Control Policy, Washington, DC.
- Strain, E.C., Bigelow, G.E., Liebson, I.A., Stitzer, M.L., 1999. Moderate- vs. high-dose methadone in the treatment of opioid dependence: a randomized trial. *JAMA* 281, 1000–1005.
- Weizman, T., Gelkopf, M., Melamed, Y., Adelson, M., Bleich, A., 2004. Cannabis abuse is not a risk factor for treatment outcome in methadone maintenance treatment: a 1-year prospective study in an Israeli clinic. *Aust. N. Z. J. Psychiatry* 38, 42–46.