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Evaluation of Opioid-Dependent Prisoners in Oral Opioid Maintenance Therapy

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Summary

Background: Opioid maintenance treatment is available in prison in many countries, but without a specific methodology or homogeneity. The aim of our study was to investigate characteristics and differences among opioid-dependent prisoners in an Austrian penitentiary. **Methods:** Structured assessments were obtained from 57 (78.1%) of 73 opioid-maintained prisoners on their demographic data, imprisonment terms, health status and quality of life. **Results:** From 1996 until 2007, the number of opioid-maintained detainees increased by 444%. Prisoners treated with methadone had significantly more convictions ($p=0.036$) and a longer duration of poly-drug abuse ($p=0.093$) and opioid consumption ($p=0.05$) than patients maintained on slow-release morphine. **Conclusions:** There is a strong need for a diversification of opioid maintenance treatments, as well as the development of a specific methodology for the use of therapeutic opioids in prison.

Key Words: Buprenorphine; Methadone; Opioid Addiction; Opioid maintenance therapy; Oral slow-release morphines; Prisoners; Substance dependence

1. Introduction

A substantial part of the population in prison is known to be substance-dependent [6, 9, 21]. Fazel et al. [27] report a prevalence of substance use disorders of 30-60% in female prisoners, and 10-48% in male prisoners. Gunter et al. [36] reported a prevalence of substance abuse/dependence in prison of 55% for women and 63% for men. In the United States, over 60% of arrested persons test positive for at least one illicit substance [12]. In Europe, as well as the United States, as many as four out of five detainees are believed to have a history of substance abuse [12, 21]. Reasons for this high prevalence of substance abuse in prison vary; many of these prisoners are sentenced for drug-related crimes (possession or trading of drugs) and crime in the pursuit of drug acquisition, suggesting that these prisoners could have been substance-dependent before detainment, while others become

dependent during their time in prison. Boys et al. [6] found that 26% of prisoners in England and Wales began using heroin while in prison. A study by Strang et al. [62] showed that the continuation of heroin use in prison occurred more frequently (70%) than the initiation of cocaine (20%) or amphetamine use (15%). In addition, previous terms of imprisonment turn out to be correlated with heroin use in prison among male prisoners and cocaine use among female ones.

Illicit substances are generally known to be easily available in prisons [21]. Due to the high frequency of violent acts committed by other detainees and a hopeless atmosphere, prisons represent a high-risk milieu for those people prone to addiction.

Prison terms could be used to stabilize prisoners' health and prevent any relapse into crime or drug consumption after release. Detoxification is often followed by a rapid relapse into criminal activities and/or the consumption of illegal

substances [34, 47, 58], eventually leading to a return to prison. Oral opioid maintenance therapy has been shown to reduce relapse rates after release from prison [42, 59], and maintenance therapy is known to generally increase quality of life as well as stabilizing patients' health by contributing significantly to a reduction of illicit consumption, and also of HIV and HCV infections, by preventing intravenous consumption and sexual risk behaviours, so reducing mortality [20, 48]. Haig refers to the effectiveness of methadone maintenance treatment in prison in reducing drug use and injection behaviour, and therefore recommends the introduction or expansion of prison-based methadone programmes [37].

Sharp differences can be found between prison populations in different countries, in terms of the crimes inmates are detained for. In Austria, there are virtually no prison sentences for the possession of small amounts of illicit substances considered to be for personal consumption only; in these cases, the principle of "therapy instead of punishment" is applied. Thus, most substance-dependent prisoners in Austria are offenders against property or have been judged guilty of acts of violence; by contrast, in the United States mandatory sentencing requirements for drug-related crimes have been introduced under what is known as the "war on drugs" policy, which has led to a more than tenfold increase in drug-related imprisonments over the last 20 years [10, 18].

Opioid maintenance therapy has been offered in prisons for almost 40 years, with the first project initiated in the United States in 1968 [17]. Nowadays, opioid maintenance therapy is available in most countries, but mainly in selected prisons [1, 15, 42]. In European countries, methadone or buprenorphine are usually offered in prison therapy regimens, with most of the regimens being detoxification- rather than maintenance-based [38]. With methadone, however, the maintenance treatment approach leads to significantly greater reductions of illicit consumption than detoxification programmes, and is therefore generally chosen for cases of long-term therapies designed to treat opioid dependence [50].

A few countries have introduced needle-exchange programmes in selected prisons; these include the United States, Switzerland, Germany, Spain, Moldova, Belarus, and Kyrgyzstan [11]; Iran introduced a needle-exchange programme in 2002 in response to an HIV epidemic in prisons [23, 64]. Needle-exchange programmes, along with opioid maintenance therapy, have been shown to reduce risk behaviours and the transmission of infectious diseases, while increasing staff and prisoner safety [14, 60].

In Austria, opioid maintenance treatment has been available since 1987 [31]. Unlike most other countries, in Austria oral slow-release morphines (SROM), in addition to methadone and buprenorphine, are registered for use in opioid maintenance therapy. Methadone, an orally administered solution, has been used to treat opioid addiction since 1965 [16]. Possible side-effects include heavy sweating, mood

swings, depression, listlessness, and weight gain [46].

The typical side-effects of methadone were observed to be weaker with SROM treatment [19], which is registered for use in opioid maintenance therapy in Austria, Slovenia and Bulgaria. In Austria, SROM is available in two different forms: a capsule filled with small wax-coated balls of morphine (Substitol® retard) and a morphine tablet with a retard surface (Compensan® retard).

Buprenorphine is considered relatively safe, due to the low level of its potential for respiratory depression [45, 51]. One of its main advantages is that dose reductions in patients treated with buprenorphine lead to fewer side-effects than dose reductions of methadone or SROM [33]. Buprenorphine is widely registered for use in opioid maintenance therapy in most Western countries. Recently, a formula comprising both buprenorphine and naloxone, an opioid receptor antagonist, has been introduced.

Opioid maintenance therapy is available in all of Austria's 28 prisons. In most countries prisoners are kept on less expensive medications (methadone, for example), whereas the prescriptions given to patients in Austria are usually for the same medication that was being used prior to detainment. The percentage of prisoners undergoing opioid-maintenance therapy rose from 7.5% in February 2002 to 8.8% in July 2008 [2, 29]. Needle-exchange programmes have not yet been introduced in Austrian prisons, although a study by Boys et al. [6] reported that 16% of IDUs initiated their intravenous use of illicit substances in prison.

1.1 Costs

The public expenditures related to substance use disorders can be split into those associated with prevention, research, treatment, rehabilitation, law enforcement and cost-of-illness [22]. The direct costs are public costs sustained for prevention and medical treatment, and those for the purchase of illicit substances, court fees, legal advice, assistance and material damage. The costs arising from indirect consequences are those due to loss of productivity, earnings, tax revenues and social insurance contributions, together with those needed to pay for social assistance. The costs of intangible consequences include the loss of well-being caused by drug addiction, i.e. disease, premature death and/or imprisonment. In Austria, public expenditures on substance-related issues have been estimated to amount to 0.08% of the gross domestic product [22].

1.2 Drug-related deaths after release from prison

A study by Farrell & Marsden [26] showed a high rate of substance-related deaths among newly released prisoners in England and Wales. Of 48,777 released prisoners, 442 died within a year, and in 68% of those cases, death was due to substance-related causes. The study also showed that the

mortality rate for women within the first week after release was 69 times higher and for men 29 times higher than that of the general population. Psycho-education on the risk of overdoses after losing tolerance, and on opioid maintenance therapy instead of detoxification, as well as on referrals to local treatment centres after release would help to decrease the mortality risk among newly released prisoners. Opioids were associated with 95% of the substance-related deaths, cocaine with 21%, benzodiazepines with 20%, and antidepressants were involved in 10% of the cases. Similarly, Pratt et al. [53] reported a high prevalence of suicides among newly released prisoners. One year after release, 382 suicides were reported; of these, 21% occurred within the first month and 51% within 4 months after release from prison. The mortality rate for women is 35.8 times higher and for men 8.3 times higher than that for the general population.

1.3 Study aims

The aim of our study was to evaluate prisoners in maintenance therapy with respect to their current oral opioid maintenance therapy, their history of substance abuse, and their previous criminal activities. Furthermore, we wanted to assess additional prescriptions for psychotropic medications, and quality of life of the participants to permit comparisons between participants who were being maintained on different oral opioids; additionally, a focus was on aspects of different groups, as hardly any data on social insurance contributions are available in reviewing the question of the diversification of opioid maintenance in prison.

2. Methods

Our investigation was approved by the Federal Ministry of Justice, and the assessment took place in February 2002. All the prisoners who participated gave written informed consent before taking part in the investigation.

2.1 Frame of Investigation/ Setting

“Justizanstalt Stein” is the largest prison for males in Austria and is located in Krems an der Donau, 74 km west of Vienna in Lower Austria. It is a males-only penitentiary with a maximum capacity of 730 prisoners. The prison is not used for pre-trial confinement.

At the time of our study, there were 719 detainees in the “Stein” prison; of these, 73 were undergoing maintenance treatment, and 57 (78.1%) agreed to participate in this survey. Three men were excluded for safety reasons, one patient was in hospital, one had insufficient knowledge of the German language, and 11 refused to participate due to lack of interest or fear of negative consequences.

The detainees work in over 30 prison-operated factories. For detainees already facing release, there are three outposts

for loose detainment.

Four psychologists, four social workers and three psychiatrists work at the penitentiary. Ward V3 is a special ward for the accommodation of opioid-dependent prisoners undergoing maintenance therapy. Due to shortage of space and for safety reasons, only 44 patients can be accommodated in the ward. If more than 44 prisoners are in treatment, some will be transferred to another ward within the prison.

Before prisoners can start treatment, illegal opiate consumption or an opioid maintenance treatment already initiated prior to detainment must be verified by urinalysis and psychiatric and clinical assessment. Weekly urinalyses are conducted during the course of treatment.

Medication intake is supervised by a nurse and two prison officers at the penitentiary.

2.2 Instruments

Patients were assessed on a standardized basis using the European Addiction Severity Index (EuropASI), the German version of the Lancashire Quality of Life Profile (Berliner Lebensqualitätsprofil, BeLP), and personal and medical records in prison.

The European Addiction Severity Index [35] is an adaptation of the fifth version of the Addiction Severity Index. It is a short semi-standardized interview for gathering information about somatic status, employment and living status, alcohol and drug abuse, legal status, family background, social network, and psychological status. The interview usually lasts between 30 and 60 minutes.

The German version of the Lancashire Quality of Life Profile (BeLP) [52, 54] is a structured interview for assessment of subjective quality of life and well-being of persons suffering from mental illnesses. The questionnaire is structured in 11 parts and usually takes between 15 to 30 minutes. Not all the items in the BeLP are applicable to patients in prison, so only selected items have been analyzed.

The medical files at the penitentiary contain information about the prisoners’ prescribed and administered medications and about any infectious diseases they may have, as well as data on psychiatric assessments (information on psychiatric comorbidities such as severe stress and anxiety disorders).

2.3 Outcome variables and cluster characteristics

Frequency and mean duration of imprisonment were registered, as well as the number and kind of crimes the participants had been convicted of. Furthermore, duration of intravenous drug use, age at onset of intravenous consumption, consumption of other drugs, prior treatment approaches, mean dosage of the maintenance medication, and concomitant medications were all recorded.

To allow comparisons between two groups in our population, it was split along the median of the appropriate char-

acteristic. The median age was 36 years. For comparisons referring to the daily dosage, the groups were split along 80 mg of methadone and 520 mg of SROM. For those referring to the age when the individuals first tried heroin, the group was split along the 19th birthday.

2.4 Data Analysis

Data were analyzed using SPSS® (Statistical Package for the Social Sciences®), version 10.0. The influence of patient age on the outcome was assessed by means of a covariance analysis. For normally distributed variables, differences in mean values of independent groups were assessed using t-tests for independent samples (e.g. differences in subgroup characteristics of medication groups), and Mann-Whitney U-tests for skew distributions. For comparisons in regard to frequency, chi-square tests, Bravais-Pearson product-moment correlations and descriptive statistics for main variables characterizing the study sample (e.g. substance abuse history and number of previous treatment approaches) were computed.

3. Results

3.1 Sample characteristics

The mean age of the 57 participating men was 35.47 years (SD=6.8 years, range 23 to 49 years). Forty prisoners (70.2%) were unmarried, four (7.0%) were married, 11 (19.3%) were divorced, and 2 (3.5%) had separated from their spouses. Forty-eight (84.2%) of the participants had completed nine years of education, one (1.8%) had a general qualification for university entrance, one (1.8%) had completed vocational school education, and seven (12.3%) had not completed any education. All the participants (98.2%), except one person who was ill, were working during their detainment.

At the time of our investigation, the mean duration of imprisonment of the participants was 86.47 months (SD=50.22, range 16 to 286 months). On average, the prisoners had been convicted 10.72 times (SD=7.06, range 3 to 40), mostly for crimes related to drug acquisition (mean=4.93 times, SD=6.11, range 0 to 28) and to drug possession or trading

(mean=3.65 times, SD=3.63, range 0 to 17) (Table 1). One individual had been sentenced to life imprisonment for committing a serious offence.

Forty-four participants (77.2%) had a hepatitis C virus infection, ten (17.5%) were uninfected, and the status of three (5.3%) was unknown. Nine participants (15.8%) were HIV positive, 46 (80.7%) were HIV negative, and the infection status of two (3.5%) was unknown.

All the participants had administered drugs intravenously at least once in their life. The mean age when they first consumed drugs intravenously was 20.95 years (SD=6.13 years, range 12 to 41 years). The duration of intravenous drug use ranged from 0 to 30 years, with a mean duration of 8.81 years (SD=7.56 years). In the six months prior to study initiation, 11 participants (19.3%) had administered drugs intravenously; all eleven reported that they had used their own needles.

Table 2 shows the participants' history of substance use. The mean duration of heroin abuse was 7.23 years (SD=6.79), with a range from 0 to 30 years. Cocaine was used for an average of 5.00 years (SD=6.42 years, range 0 to 24 years).

In Table 3, the treatment data are displayed; on average, the participants underwent 10.09 treatment approaches for their substance dependence (SD=15.29, range 0 to 74), showing a range for their current therapy between the first and the 75th therapy in their lives.

Table 4 shows the participants' satisfaction with their lives. Most patients (16; 28.1%) declared themselves to be "alternately satisfied and unsatisfied". Most of the participants (30; 52.6%) were satisfied with their somatic health status (ranging from "rather satisfied" to "completely satisfied"), compared to 20 (35.1%) participants who were dissatisfied (ranging from "completely unsatisfied" to "rather unsatisfied"); 7 (12.3%) were "alternately satisfied and unsatisfied". Twenty-five participants (43.9%) were satisfied with their mental health status, 13 (22.8%) were "alternately satisfied and unsatisfied", and 19 (33.3%) were unsatisfied.

At the time of our investigation, twenty-three study participants (40.4%) were maintained on methadone, while 34 (59.6%) were maintained on SROM (none of them were being maintained on buprenorphine).

Table 1: Number of charges, convictions, and months in prisons (n=57)

	Average	SD	Minimum	Maximum
Charges for drug crime	3.65	3.63	0	17
Charges for crime in the pursuit of drug acquisition	4.93	6.11	0	28
Charges for violent crime	2.46	3.64	0	16
Convictions	10.72	7.06	3	40
Months in prison	86.47	50.22	16	268

Table 2: Substance abuse history, in years (n=57).

Substance	Average	SD	Minimum	Maximum
Heroin	7,23	6,79	0	30
Methadone	3,07	4,39	0	22
Other opioids and analgesics	5,23	6,91	0	30
Benzodiazepines	6,12	7,42	0	24
Cocaine	5,00	6,42	0	24
Amphetamines	1,54	3,80	0	20
Cannabinoids	14,61	9,45	0	36
Hallucinogens	0,35	1,08	0	07
More than one substance per day	11,95	7,90	0	30

Table 3. Number of previous treatment approaches (n=57)

Pre-treatment	Average	SD	Minimum	Maximum
Outpatient detoxification	1,33	2,86	0	17
Inpatient detoxification	2,18	4,64	0	23
Maintenance treatment	1,88	1,05	1	7
Outpatient treatment	2,46	10,09	0	72
Inpatient treatment	0,95	2,89	0	20
Day care unit	0,40	2,65	0	20
Psychiatric clinic	0,88	4,65	0	35
Total number of treatments	10,09	15,29	1	75

Table 4: Satisfaction according to BeLP, in % (n=57)

	Completely unsatisfied	Unsatisfied	Rather unsatisfied	Alternately satisfied and unsatisfied	Rather satisfied	Satisfied	Completely satisfied
Satisfaction with life	12,3	12,3	14,0	28,1	15,8	14,0	3,5
Satisfaction with somatic health status	5,3	19,3	10,5	12,3	15,8	24,6	12,3
Satisfaction with mental health status	8,8	8,8	15,8	22,8	15,8	19,3	8,8

On average, the initial methadone dose was 69.86 mg (SD=39.68 mg, range 10 mg to 200 mg), and the SROM dose was 312.50 mg (SD=169.79 mg, range 200 mg to 720 mg). After an average of 13.35 months (SD=8.49 months, range 1 to 39 months) from the start of the study, the mean doses had changed to 78.04 mg methadone (SD=28.99 mg, range 20 mg to 120 mg) and 486.47 mg SROM (SD=201.87 mg, range 90 mg to 800 mg). Only 11 participants (19.3%) were maintained on the same amount of medication they were taking at the beginning of their therapy; 21 participants (36.8%) had a higher dose, while 8 participants (14.0%) were on a lower dose. Seventeen participants (29.8%) had changed their opioid medication.

Only nine participants (15.8%) did not receive any other prescription medicine; twenty-one participants (36.8%) had a prescription of one additional medication, and one person (1.8%) was receiving six additional medications. Most of the participants (37 participants; 64.9%) had a prescription for benzodiazepines, of which Anxiolit®, a sedative containing oxazepam, was the one prescribed most frequently

3.162, df=41.32, p=0.003) and a markedly shorter history of intravenous use (mean=7.00 years, SD=6.66 vs. 10.34 years, SD=8.05, t=-1.743, df=55, p=0.087). Patients maintained on low doses were less likely to suffer from severe depression than patients maintained on high medication doses ($\chi^2=5.009$, df=1, p=0.025). In addition, patients on low doses were markedly less likely to be in debt ($\chi^2=2.818$, df=1, p=0.093) and also considerably less likely to have experienced severe stress and anxiety disorders during the previous 30 days ($\chi^2=3.499$, df=1, p=0.061). Patients maintained on low doses tended to spend their leisure time with friends, while patients on high doses tended to spend their free time alone ($\chi^2=2.850$, df=1, p=0.091). The duration of methadone consumption (mean=1.74 years, SD=3.08 vs. 4.27 years, SD=5.05, U=230.000, Z=-2.869, p=0.004) and benzodiazepine consumption (mean=4.37 years, SD=6.37 vs. 7.70 years, SD=8.03, U=297.500, Z=-1.758, p=0.079) were shorter in patients who were taking low doses than in those who were receiving high doses.

Patients who first tried heroin before their 19th birthday

Table 5: Differences between persons maintained on methadone and persons maintained on slow-release oral morphines (SROM)

	Persons maintained on methadone N=23	Persons maintained on SROM N=34
Mean age (in years)	37.35	34.21
Average number of convictions	13.09	9.12
Mean duration of opiate consumption	5.3	1.56
Mean duration of multiple drug abuse	14.09	10.50

(24 participants; 42.1%). Twenty participants (35.1%) had a prescription for antidepressants, fourteen (24.6%) were receiving neuroleptics, and two (3.5%) were taking anticonvulsants (see Figure 1).

3.2 Differences between medication groups and clustered subgroups

Patients maintained on methadone were markedly older than patients maintained on SROM (mean age 37.35 years (SD=6.85) vs. 34.21 years (SD=6.56), t=1.743, df=55, p=0.087). Additionally, patients on methadone had a record of significantly more convictions (mean=13.09, SD=8.63 vs. 9.12, SD=5.32, t=2.150, df=55, p=0.036) and showed a considerably longer duration of opiate consumption (5.3 years vs. 1.56 years, t=3.028, df=55, p=0.005), as well as multiple drug abuse (14.09 years vs. 10.50 years, t=1.709, df=55, p=0.093).

Patients maintained on low doses of opioids (less than 80 mg methadone per day or less than 520 mg SROM per day) had a significantly shorter history of opiate abuse (mean=2.84 years, SD=3.69 vs. 7.70 years, SD=8.16, t=-

had a shorter education than those who tried heroin for the first time after their 19th birthday (mean=8.79 years, SD=1.93 vs. 9.64 years, SD=1.45, U=316.500, Z=-1.704, p=0.088).

For assessment of quality of life, participants were divided into two groups according to their scores in the Lancashire Quality of Life Profile: those whose reply was “completely satisfied”, “satisfied”, “rather satisfied” or “alternately satisfied and unsatisfied” constituted the group with high satisfaction, and those who replied “rather unsatisfied”, “unsatisfied” or “completely unsatisfied” constituted the group with low satisfaction.

Participants who were satisfied with their lives experienced significantly less psychological problems during the previous 30 days (t=2.142, df=31.14, p=0.040), were more likely to be HIV-negative ($\chi^2=3.742$, df=1, p=0.070), and had more friends they could rely on in case of need or emergency ($\chi^2=5.370$, df=2, p=0.068) compared to those who were unsatisfied with their lives.

Patients whose reply was “completely satisfied”, “satisfied” or “rather satisfied” in the Lancashire Quality of Life Profile had a history of 9.52 years of heroin abuse (SD=8.37), which is significantly longer than patients whose indication

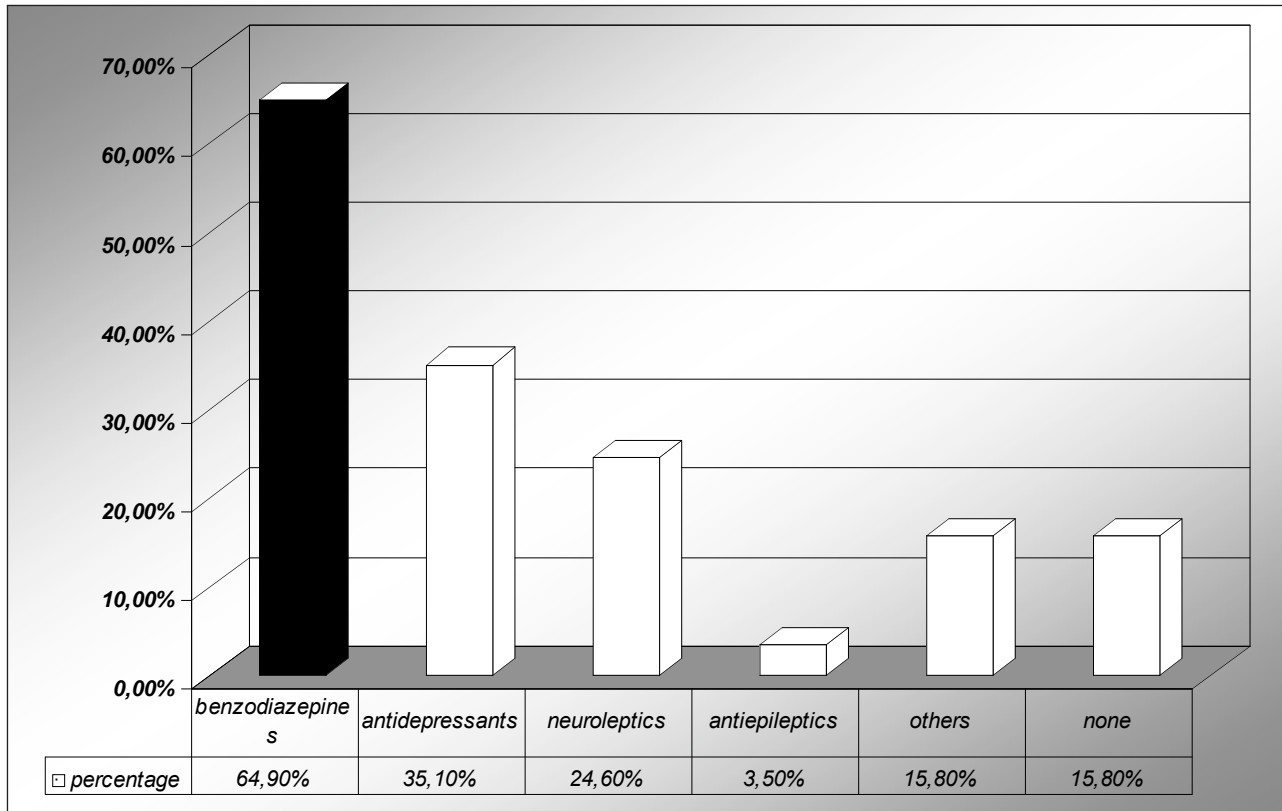


Figure 1. Number of patients prescribed additional medications (n=57).

was “alternately satisfied and unsatisfied”, “rather unsatisfied”, “unsatisfied” and “completely unsatisfied”; this second group had a mean history of 5.44 years of heroin abuse (SD=4.65) ($t=-2.190$, $df=25.28$, $p=0.035$). Participants who were satisfied had suffered from withdrawal symptoms on significantly fewer days during the previous 30 days ($\chi^2=6.502$, $df=2$, $p=0.039$) and had had fewer consultations due to mental health problems during the previous year ($\chi^2=3.792$, $df=1$, $p=0.051$) than unsatisfied participants.

3.3 Development at “Stein” penitentiary

We examined the number of substance-maintained individuals in the “Stein” prison, and found a constant increase in this sub-population over time. At the end of 1996, 18 detainees were in maintenance treatment. At the end of 2000, this population had doubled, and by the end of 2002 had quadrupled, with 89 patients undergoing therapy. The total number of detainees fluctuated between 630 and 719 over these years.

During preparation of this article, we found that by the end of 2007, 98 prisoners were in maintenance treatment. Twenty-six (26.5%) were receiving methadone, 43 (43.9%) SROM, and 29 (29.6%) were being maintained on buprenor-

phine. Twelve (12.2%) were HIV-positive, and 74 (75.5%) were HCV-positive. Ninety-one patients (92.9%) had a prescription for benzodiazepines.

4. Discussion

At the time of this study, only a few reports investigating patient and treatment characteristics of opioid-dependent detainees and evaluating their quality of life in this setting were available; thus, despite the small size of our group, our study constituted a rather innovative approach.

The educational status of the participants in this study seems to be extraordinarily high, as 87.7% of the participants had completed nine or more years of education, but this is consistent with the generally high educational standards in Austria due to the relatively long obligation to attend school [28]. Prison populations in other European countries show a similar level of education [39].

As detainees in Austria (§44 and §48 Strafvollzugsgesetz) as well as in Germany (§37 and §38 Strafvollzugsgesetz) are obliged either to work or to attend classes, our study had an extremely high prevalence of working patients (98.2%). Although opioid dependence constitutes a severe somatic disease, patients seem to be able to work if they do not suffer

from withdrawal symptoms or take illicit substances.

Most of our participants had been convicted for drug-related crimes, which is consistent with findings from other studies [27]. Our study did not evaluate how many participants initiated their drug use during previous detainments, as heroin use has been shown to be strongly related to the total time spent in prison [6].

A high frequency of previous treatments was observed in the participants in this study, while Kinlock et al. found a greater variation regarding the number of previous therapies in US prisoners [41]. This difference may be accounted for by the high treatment availability for opioid dependence in Austria.

In Austria, arrestees are routinely assessed for opioid dependence, and treatment is provided if needed, whereas assessment and therapeutic intervention is not part of the standard care provided in many Western countries, e.g. in the USA only approximately half of all jails assess arrestees for opioid dependence; and although most US prisons report using standardized detoxification protocols, very few offer opioid medication for detoxification treatment [30]; in a UK study, nearly a quarter of substance dependent prisoners claimed to have experienced withdrawal symptoms after they were arrested [8].

The diversification of administration of opioid medications in our study population can be explained by the common Austrian practice of prescribing the same medications in prison that the patients had been using prior to imprisonment. As with any other disease, diversification is a necessary procedure in choosing the best treatment option according to the characteristics of patients. In 2002, patients were all maintained on methadone or SROM; no patients were maintained on buprenorphine. By 2007, most of the patients were maintained on SROM, while methadone ranked only third, surpassed by buprenorphine. This does not exactly reflect opioid maintenance treatment approaches outside prison [55], but as prisoners in Austria usually receive prescriptions for the same medications they used before imprisonment, our data do not necessarily reflect prison doctors' choices. The difference in prescribed medications may result from the fact that our participants constitute a population with more serious health problems than the average opioid-maintained population, as they had, on average, undergone more than 10 treatment approaches.

Opioid maintenance treatment has been shown to reduce risk behaviour, although this only occurs if patients with these problems have an opportunity of avoiding risk behaviour. Sarang et al. [57] describe needle-sharing as a routine consequence of unavailable needle-exchange programmes in a Russian prison. The prevalences of HCV and HIV infections in our population were consistent with those in opioid-dependent patients in Austria [32]. Due to the relatively long duration of treatment and the low compliance with treatment in the outside world, detainment in prison might provide an ideal

environment for treating chronic hepatitis C virus infection. Independently of this, Article 3 of the European Convention on Human Rights bans denying adequate medical treatment for prisoners. Treatment of chronic hepatitis C virus infection with interferon and ribavirin has been introduced in selected prisons in Canada [24, 25], USA [61] and Italy [56]. Tan et al. [63] showed that the treatment of HCV infection is cost-effective not only in the general population, but also in prison populations; in addition, treatment has been shown to increase quality of life in prison.

As most of our participants have been convicted for drug-related crimes, imprisonment might be an ideal environment for stabilizing patients, either by optimizing their existing maintenance treatment or by initiating maintenance therapy. This might lead to fewer drug-related crimes and fewer lethal overdoses after release, as substance-dependent persons are at high risk of drug overdose after release from prison [4, 26, 40]. Farrell & Marsden [26] found that benzodiazepines were involved in 20% of drug-related deaths among newly released prisoners. Recent investigations show the benefits of aftercare following release from prison with reference to the consumption of illicit substances [43, 44]. Opioid maintenance therapy has been shown to possess a preventive function against drug-related deaths following release from prison [26].

Our population showed a high level of concomitant benzodiazepine intake (64.9%). As the concomitant consumption of benzodiazepines is a strong indicator for high-risk behaviour and poor retention in treatment programmes [5, 7, 13], and it increases the potentially lethal effects of opioids by depressing the sensitivity of the respiratory center in the brain stem for carbon dioxide, while being associated with a high risk of overdose [3, 49], this observation in our study population should not be overlooked. Benzodiazepines may be necessary in particular environments such as prisons due to a high incidence of anxiety, sleep disorders, aggressive behaviour against oneself and others, but this treatment might hinder social attachment and ability to work after release, and have fatal effects. The high number of benzodiazepine prescriptions and the rise of prescriptions from 64.9% to 92.9% highlight the potentially high level of unawareness in doctors without a specialization in addiction medicine of the risks of benzodiazepine use.

In conclusion, the present study showed that opioid maintenance therapy can be safely offered in prison, regardless of which substance is used; thus, there is no reason for avoiding diversification, although it would probably be appropriate to design a specific methodology for the use of the different substances.

Prisoners maintained on methadone were older and had a longer history of criminal behaviour, opiate consumption and polydrug abuse, but they showed no difference in well-being and quality of life compared to the prisoners maintained on SROM. In a randomized controlled double-blind

double-dummy study conducted by Eder et al (2005), patients receiving SROM did not show any significant demographic differences, but had significantly lower depression and anxiety scores and fewer physical complaints compared to subjects maintained on methadone [19]. The differences revealed in these samples will be related to the different availability of medically prescribed opioids; methadone was introduced in Austria in 1992, while SROM has been slowly introduced in the past decade. The long-term consequences should be investigated in a prison setting.

Quality of life generally seems to be high, as virtually all patients were working 8 hours a day, mostly in skilled trades. Those who were satisfied with their lives experienced fewer psychological problems, fewer withdrawal symptoms and had a more reliable social network, and thus seemed to comprise a group with better health, but, surprisingly, they had a markedly longer history of heroin abuse. No explanation for this fact could be found.

Patients maintained on lower doses of methadone or SROM seemed to be less ill than those maintained on higher doses, in terms of their history of drug abuse, depression and anxiety disorders.

Offering opioid maintenance therapy in prison may lead to a fall in reincarceration rates after release due to stabilization and easier reintegration into society, and thus may help to limit public spending on social welfare. Oral opioid maintenance therapy has been shown to be safe with respect to abuse and passing on the medication to other detainees if offered under standardized circumstances and supervised intake. Despite this, there is still a strong need for the development of a specific methodology for opioid administration in penitentiaries worldwide.

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