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Effect of prison-based opioid substitution treatment, and post-release retention in treatment, on risk of re-incarceration.

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Abstract

Aims: People who use heroin are frequently incarcerated multiple times. Reducing re-incarceration of this group is important for reducing both health risks associated with incarceration and the costs of correctional administration. Opioid substitution treatment (OST) in prisons may help to reduce re-incarceration, but research findings on this topic have been mixed. In this study, we examined the effect of OST in prison and after release on re-incarceration.

Design: Longitudinal cohort study.

Setting, participants and measurements: Data on OST and incarceration were linked for a cohort of 375 male heroin users originally recruited in prisons in New South Wales, Australia. Data were linked for the period 1 June 1997-31 December 2006. Re-incarceration was examined using recurrent-event survival analysis models. Model 1 examined the effect of OST status at release from prison (i.e. in treatment vs. out of treatment on the day of release) on re-incarceration. Model 2 considered the effect of remaining in OST after release on risk of re-incarceration.

Findings: Ninety per cent of participants were re-incarcerated following their first observed release. Pre-incarceration cocaine use was associated with a 13% increase in the average risk of re-incarceration. There was no significant association between simply being in OST at the time of release and risk of re-incarceration; however, in the model taking into account post-release retention in treatment, the average risk of re-incarceration was reduced by 20% while participants were in treatment.

Conclusions: In New South Wales, Australia, opioid substitution treatment after release from prison has reduced the average risk of re-incarceration by one-fifth.

Incarceration is a common experience among people who use heroin. In the United States, an estimated one-quarter to one-third of all heroin users pass through a correctional facility annually (1). In the United Kingdom, one-third of a cohort of heroin users seeking treatment were incarcerated during a five-year period (2). Cross-sectional data show high levels of self-reported history of incarceration among Australian heroin users, with prevalence ranging from 41% (3) to 52% (N. Sindicich, national co-ordinator, Illicit Drug Reporting System, personal communication, 2 April 2010). Unsurprisingly, longer duration of heroin use has been associated with increased likelihood of incarceration, with each additional year of use translating to an 11% increase in risk of having ever been in prison (4).¹

Upon leaving prison, inmates with a history of heroin use typically resume frequent heroin consumption (5, 6), and therefore are likely to commit further offences and be re-incarcerated. In an earlier follow-up of the cohort examined in this paper, 82% of participants who had been released from prison were re-incarcerated at least once during a four-year period (7). Re-incarceration is often rapid, with half of released heroin users returning to prison within six months in studies in the United States (8) and France (9).

This cycle of repeated incarceration and release exposes heroin users to particular risks. While in prison, it is common for heroin use to continue, albeit with reduced frequency (6, 10, 11). Lack of access to sterile needles and syringes in prisons (12) means that sharing of injecting equipment is highly prevalent, leading to transmission of blood borne viral infections (13-19). On release from prison, heroin users face a greatly increased risk of death (20-24), and a higher number of releases from prison is associated with greater increases in risk of death (25).

¹ In keeping with international usage, the term 'prison' is used to refer to any institution for the detention of individuals charged with or convicted of a criminal offence.

Repeated incarceration of heroin users also imposes a significant financial burden on the criminal justice system; this burden is not offset by benefits to the community in terms of reduced offending (26-28). Research suggests that reducing re-incarceration of released inmates (as opposed to reducing the number of first-time prisoners) is key to reducing overall prisoner numbers and correctional spending (26, 29). Thus, reducing re-incarceration of heroin users will have benefits for both the individual and the community.

One approach to reducing re-incarceration has been the provision of opioid substitution treatment (OST; i.e. maintenance pharmacotherapy with opioid agonists such as methadone or buprenorphine) in prisons. Two relatively early studies of prison OST reported that treated inmates had lower re-incarceration rates than their untreated peers (30, 31); however, recent studies in the United States and France found no effect of treatment on re-incarceration (8, 9). A randomized controlled trial (RCT) of methadone maintenance in the Baltimore correctional system found that at three-months post-release, treated inmates were less likely to have been re-incarcerated than those in the control conditions, but by six-month follow-up, this difference was no longer evident (32, 33).

A limitation of previous studies of prison OST has been a lack of analysis of post-release participation in OST. In studies of community-based OST, reduced re-incarceration risk is only seen while individuals remain in treatment (2). It is likely that this is also the case when individuals are released from prison while in treatment. The results from the multiple follow-ups of the Baltimore RCT are suggestive of this; potentially, the lower re-incarceration at three-month follow-up among treated participants was mediated by their ongoing retention in treatment, and as more participants dropped out of treatment over time, the difference between groups disappeared (32, 33). In light of this, the present study aimed to examine the role of prison OST, and post-release retention in treatment, in reducing re-incarceration of heroin users.

Method

Ethical approval

Ethical approval for this study was provided by the NSW Department of Health Population and Health Services Research Ethics Committee, the Justice Health Research Ethics Committee, the NSW Department of Corrective Services Research Approval Committee and the University of NSW Human Research Ethics Committee. Approval was contingent on using the Centre for Health Record Linkage (CHeReL) to conduct the data extraction and linkage aspects of the study. The CHeReL acts as a third-party intermediary between data custodians and researchers to protect the privacy and confidentiality of individuals whose data are accessed (34).

Participants

Participants were 375 male heroin users originally recruited in prisons in New South Wales (NSW), Australia, in 1996-97, to take part in a randomized controlled trial of opioid substitution treatment (35). To participate in the trial, prisoners were required to be male (a pilot study had demonstrated that it would not be possible to recruit sufficient numbers of female inmates with sentences of sufficient length); have a history of heroin injection as determined by clinical interview and examination by an addiction medicine physician; be serving a sentence of at least four months; and be willing to be randomised to either OST or wait-list control. Participants assigned to the treatment condition were prescribed and dispensed methadone as part of the larger prison OST program. Participants assigned to the control condition could enter OST after four months (the initial follow-up period of the trial) (35).

Data linkage

Participant names, aliases, dates of birth and dates of last contact were provided to the CHeReL. Records matched to participants were extracted from three administrative databases: the Offender Integrated Management System, the Pharmaceutical Drugs of Addiction System, and the CHeReL Master Linkage Key.

The Offender Integrated Management System (OIMS)

The OIMS is maintained by Corrective Services NSW, and contains records of all prisoner admissions, transfers and releases. Variables extracted from the OIMS were dates of entry to, and exit from, prison.

The Pharmaceutical Drugs of Addiction System (PHDAS)

The NSW Health Department PHDAS monitors the prescribing of medications used in OST. Variables extracted from the PHDAS were dates of entry to, and exit from, OST.

The Master Linkage Key (MLK)

The Centre for Health Record Linkage maintains a Master Linkage Key of population-level datasets, including mortality datasets. Variables extracted from the MLK were date and cause of death.

Data were extracted for the period 1 June 1997-31 December 2006. It had originally been intended that data would be extracted for the calendar years 1997-2006; however, the OIMS was only implemented in May 1997 and it was not possible to obtain unit record data prior to this period. Because of this, it was possible that some participants had been released from the baseline incarceration prior to the start of the observation period.

Data analysis

Model selection

Participants could experience the event of interest – re-incarceration – multiple times over the observation period. Modelling of time-to-event data with multiple events per individual requires statistical models that account for correlations of event times within individuals. For the present analyses, the Prentice-Williams-Peterson gap-time (PWP-GT) model (36) was determined to be the most appropriate of the various recurrent event models (37, 38). The PWP-GT model is an extension to the Cox model in which dependence of event times within individuals is accounted for by stratifying the analysis by event number (37-40). ‘Gap-time’ refers to the manner in which time is ‘re-set’ to zero

each time an event occurs. This allows modelling of time between events, rather than time to each event from the beginning of the observation period (41). This is particularly useful for analysis of re-incarceration, as it allows modelling of multiple periods of time from release to re-incarceration, while excluding time spent in prison (i.e. time during which it is not possible to experience a re-incarceration event).

Data structure

The OIMS incarceration data were manipulated to allow analysis of 'release intervals'. Each release interval began with a release date, and ended at either the date of re-incarceration, date of death or 31 December 2006 (the end of the observation period) (8). Release intervals ending on 31 December 2006 without a re-incarceration were censored, as were release intervals that ended because the participant died. Release intervals were linked to the OST data, and two variables describing OST exposure were defined. For the first variable, release intervals were categorised as 'treated' if the participant was in OST at the start of the release interval, and 'untreated' if not. This variable thus identified if a person was in treatment when released from prison, in line with prior research (8). The second variable recorded the number of days a participant remained in OST from the beginning of the release interval; for untreated release intervals, this variable was coded as 0.

Model building

Two multivariate, recurrent event survival models were developed. Model 1 incorporated the OST variable indicating the treatment status of the release interval. Treated release intervals were coded as 1, and untreated release intervals as 0.

Model 2 used the information on retention in treatment after release from prison. The number of days that a participant remained in treatment after release was included in the model as a time-dependent variable. Participants with treated release intervals commenced the release interval with an OST value of 1, which changed to 0 at the time of ceasing treatment.

To identify covariates for inclusion in the models, a range of variables from the original trial dataset were tested for univariate associations with re-incarceration. Covariates tested were age at first drug injection; age at first incarceration; age at release; Indigenous status; number of prior incarcerations; use of heroin during baseline or prior incarceration; injecting drug use during baseline or prior incarceration; and types of drugs used in the month prior to baseline incarceration. Variables with univariate $p \leq 0.25$ were included in the multivariate models (40).

Results

Participant demographics

All participants were male. The median age of participants at baseline was 26 (range 18-46), and 24% (91/375) of participants identified as Aboriginal or Torres Strait Islander. Drug use and imprisonment histories prior to the baseline incarceration are shown in Table 1.

Opioid substitution treatment engagement during observation

During the nine years and seven months of observation, 88% (331/375) of participants were in OST for at least one day. Participants commenced a total of 1,081 OST episodes, with a median of two (range 1-12) episodes per participant. Over half (58%; 632/1,081) of these episodes were commenced in prison, and 80% (300/375) of participants commenced at least one OST episode in prison. Median episode length (based on 926 episodes with start and end dates within the observation period) was 156 days (range 1-2,957), or approximately 5.5 months. The median total length of time in treatment over the observation period was 592 days (range 3-3444), or 1.6 years.

Incarceration during observation

Between 1 June 1997 and 31 December 2006, all but two (99.5%, 373/375) participants spent at least one day in custody. Three participants were incarcerated for the entire observation period. Participants commenced 2,036 custodial episodes, with a median of five (range 1-25) episodes per participant. The median length of each episode (based on

1,946 episodes with start and end dates within the observation period) was 99 days (range 1-3180 days). The median total time in prison over the observation period was 1337 days (range 0-3500 days), or 3.6 years.

Risk of re-incarceration

370 of 375 participants were released from prison at least once between 1 June 1997 and 31 December 2006 and were therefore at risk of re-incarceration. Ninety percent (332/370) of released participants were re-incarcerated at some point following their first observed release.

There were 2088 release intervals during the observation period; 40% (842/2088) were treated release intervals. The median number of release intervals was 4 (range 1-23). The median length of release intervals (i.e. time to re-incarceration or censoring) was 111 days (range 1-3391) and the median duration of post-release retention in OST was 63 days (range 1-3391).

In univariate analyses, the treatment status of the release interval (i.e. in treatment or not in treatment on day of release) was not significantly associated with re-incarceration. The univariate analysis testing the effect of retention in treatment on re-incarceration, however, found that the average risk of re-incarceration while in treatment was 79% of that while not in treatment. Of the covariates, age at first incarceration, age at release and pre-incarceration use of cannabis, amphetamine, cocaine and prescribed methadone were associated with re-offending at the $p \leq 0.25$ level (Table 2). These covariates were entered into the two multivariate models.

In Model 1, controlling for the entered covariates, there was no statistically significant association between OST status at release from prison and risk of re-incarceration. Age at release was significantly associated with re-incarceration, with each additional year of age associated with a 3% decrease in risk of re-incarceration. Pre-incarceration cocaine use increased the risk of re-incarceration by 13% (Table 2).

In contrast to Model 1, there was a significant effect of OST exposure on re-incarceration in Model 2. As long as participants remained in OST, the average risk of re-incarceration was 80% that of participants who were not in OST (Table 2). As in Model 1, older age at release was associated with a small reduction in risk of re-incarceration, and pre-incarceration cocaine use was associated with an increased risk of re-incarceration.

Number of prior incarcerations is often strongly associated with risk of re-incarceration. This was not the case in the analysis at hand; however, to assess for possible residual confounding, the multivariate models in Table 2 were re-analysed with number of prior incarcerations included as a covariate. This did not significantly alter the results reported in Table 2.

Discussion

This study has found that being in OST at release from prison did not significantly affect re-incarceration; however, when retention in treatment was factored into the statistical model, it was found that as long as participants remained in OST after release, the average risk of re-incarceration was reduced by 20%. Thus, it appears that it is not OST exposure in prison *per se* that affects re-incarceration, but whether a person remains in treatment following release. This concurs with research showing that the benefits of OST are maintained only while individuals remain in treatment; in community samples, rates of criminal offending and incarceration are reduced only while in OST, rising during periods out of treatment (42-44). Although the reduction in risk is modest, modelling studies show that even small reductions in re-incarceration among those individuals with the highest re-incarceration rates produce significant benefits in terms of reducing the size of the prisoner population and the costs of correctional administration (26).

The analysis also demonstrated that cocaine use prior to the baseline incarceration was associated with a significantly increased risk of re-incarceration. In contrast to countries such as the US and UK, where crack cocaine dominates markets, cocaine powder is the most common form of the drug found in Australia (45, 46) Two distinct groups of cocaine users have been identified, one comprising educated, employed, affluent professionals

who occasionally snort cocaine, the other, socially and economically marginalised individuals who inject a range of drugs, including cocaine (47). In Australia, one other longitudinal study of heroin users in treatment has identified that baseline cocaine use is associated with poorer treatment outcomes, including higher rates of incarceration (48). Internationally, contingency management has been identified as an efficacious intervention for cocaine use among OST patients (49), but there have been no studies of this approach in Australia. Although cocaine use is a low-prevalence concern in this context, given that it appears to have a negative effect on treatment outcomes, contingency management is recommended when clinically indicated.

Although risk of re-incarceration was reduced as long as participants were retained in treatment, the median retention time was only 63 days. That is, in half of treated release intervals, treatment had ceased within two months of release. The post-release period is a highly stressful time, marked by difficulties in finding appropriate housing and legal income (50, 51). Daily attendance at a clinic for pharmacotherapy is one of many competing priorities for released inmates, and one that appears to be difficult to maintain. Comprehensive pre-release planning and post-release support is needed to address not only treatment needs, but also the multitude of other difficulties that released inmates contend with. In NSW, such a program was implemented in September 2007. The Connections Project aims to link inmates with drug treatment and other health and welfare service providers post-release. Community support workers engage with inmates prior to release, with a focus on ensuring continuity of OST, as well as assisting inmates to access housing, social security benefits and healthcare providers as needed (52). Community OST policies should also recognise that released inmates are a priority population for treatment entry (53), and address barriers to treatment access such as waiting lists and service fees.

It could be argued that, because post-release retention is the key to reducing re-incarceration, there is no need to provide OST while in prison, and that resources should instead be directed to assisting inmates with a history of heroin use to enter OST on release. However, several studies have shown that post-release entry to OST is maximised

when treatment is commenced while in prison (54-56). For example, in the Baltimore RCT, those who had been in treatment while in prison were significantly more likely to enter post-release treatment than participants who were simply given a post-release treatment referral (54). There are also other benefits to OST in prison, such as reduced drug injecting and injecting-related HIV risk behaviours (35, 57). Hence, the maximum benefits from OST can be obtained by commencing (or continuing) treatment while in prison, and providing assistance to ensure a smooth transition to a post-release treatment provider.

A key factor differentiating this research from previous studies was the use of post-release OST records in addition to OST records pertaining to time in custody. This was possible as all OST episodes in NSW are recorded in the PHDAS, regardless of the location of treatment. In contrast, studies elsewhere have reported being unable to consider post-release treatment participation specifically because OST records during incarceration could not be linked with OST records from community treatment settings (9). Given the importance of post-release OST retention in determining post-release outcomes, future research in this area should attempt to include indicators of post-release treatment retention in analyses. If a centralised database containing all OST episodes is not available, efforts should be made to link prison-based and community-based systems for recording OST episodes. If linkage is not possible, it may be necessary to follow-up participants in person; however, this is generally only feasible if there are no more than several hundred participants in the study. Furthermore, individuals are unlikely to be able to recall precise dates of treatment exposure.

It is important to note that in early 2001 (i.e. around halfway through our observation period of 1997-2006), Australian heroin users reported difficulties in obtaining heroin (58). The “heroin shortage” had impacts on initiation to heroin use (59) and patterns of illicit drug use (60), crime (61), and OST (62). It is plausible that these changes may have affected the patterns of treatment and incarceration observed among participants in this study. However, one of the key findings of heroin shortage research was that its effects were most pronounced among younger drug users rather than older, more entrenched

users such as those in this study. For example, although reductions were seen for all age groups in criminal charges for heroin use/possession, these were most marked in younger age groups (63). Additionally, the shortage had no impact on treatment entry among people with a history of OST (62). Given that the participants of this study had extensive drug use, OST and incarceration histories, it is unlikely that the heroin shortage played a significant role in the observed patterns of treatment participation and incarceration.

There were several limitations to the study. As an observational study, it was not possible to determine causality from our data, and it is possible that results were confounded by unobserved factors. The cohort was originally recruited in prison, and prior incarceration is a strong predictor of future incarceration (64); therefore, the rate of re-incarceration seen in this cohort may be higher than that seen if the cohort had been recruited from heroin users in the community. The more severe profile of this cohort may have resulted in conservative estimates of treatment effects; alternatively, the benefits of OST may be overestimated in comparison to a more representative cohort with a lower re-incarceration rate. Finally, the cohort was all male, but around one-third of Australian heroin users are women (3, 65). Female heroin users in treatment tend to have a more severe clinical profile than their male counterparts, being more likely to report suicidal ideation and suicide attempts (66), and more likely to suffer major depressive disorder (67) and post-traumatic stress disorder (68). Despite these differences, gender is not in itself a predictor of OST outcomes (69), lending weight to the notion that the reported relationship between OST and incarceration may also hold for women. Research specifically incorporating incarcerated female heroin users should be conducted to determine if this is the case.

For the results of this study to be generalisable to other jurisdictions, the availability of OST in correctional facilities must be taken into account. This study was undertaken in a jurisdiction in which OST is readily available in the community and in prisons. In NSW prisons, OST is available to any inmate who enters prison already in treatment. Inmates may also enter OST while in prison if they request treatment and medical assessment finds them suitable for such. Internationally, few correctional jurisdictions provide this

level of treatment access (70). The full benefits of prison-based OST are unlikely to be realised in correctional environments with limited access to treatment.

With this study, we have demonstrated that exposure to OST in prison and post-release reduces the average risk of re-incarceration. The maximum benefits of prison-based OST can be obtained by providing treatment in prison, and supporting inmates to remain in treatment after release. In addition to the benefit to the individual, reduced re-incarceration of heroin users would benefit the correctional system as a whole, through reducing the size of the prisoner population and the costs of correctional administration.

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Table 1: Baseline drug use and incarceration histories for 375 heroin users in NSW prisons

Drug use and incarceration history	Median (range)
Age first injected drugs	16 (7-40)
Age first incarcerated	18 (15-43)
Number of prior custodial episodes	4 (1-62)
Drug use in month prior to baseline incarceration	
	n (%)
Heroin	360 (96.0)
Cannabis	312 (83.2)
Benzodiazepine	261 (69.6)
Amphetamine	163 (43.5)
Extra-medical methadone	162 (43.3)
Cocaine	143 (38.1)
Prescribed methadone	30 (8.0)
Number of above drug types used	
Median (range)	4 (1-6)
Drug use during baseline or prior incarceration	
	n (%)
Used heroin in prison	239 (63.7)
Injected heroin in prison	226 (60.3)
Any drug injection in prison	238 (68.4)
<i>Shared needle/syringe in prison</i>	195 (81.9)*

*% of participants reporting any drug injection in prison who shared needle/syringe in prison

Table 2: Recurrent event models of the effect of OST status at release from prison, and retention in OST post-release, on risk of re-incarceration

	Univariate*		Multivariate models*			
	hazard ratio (95% CI)	p	Model 1 adjusted hazard ratio (95% CI)	p	Model 2 adjusted hazard ratio (95% CI)	p
Opioid substitution treatment variables						
Treatment status of release interval	0.96 (0.86-1.06)	0.4	0.98 (0.88-1.09)	0.64		
OST status post-release [#]	0.79 (0.70-0.89)	<0.0001			0.80 (0.71-0.90)	0.0002
Covariates						
Age at first drug injection	1.00 (0.99-1.00)	0.74				
Age at first incarceration	0.98 (0.97-1.00)	0.01	1.00 (0.98-1.02)	0.91	1.00 (0.98-1.02)	0.96
Age at release	0.97 (0.96-0.98)	<0.0001	0.97 (0.96-0.98)	<0.0001	0.97 (0.96-0.98)	<0.0001
Indigenous status	1.05 (0.93-1.18)	0.45				
Pre-incarceration cannabis use	1.09 (0.94-1.26)	0.25	1.06 (0.91-1.24)	0.45	1.07 (0.91-1.25)	0.41
Pre-incarceration benzodiazepine use	1.00 (0.89-1.12)	0.98				
Pre-incarceration amphetamine use	0.93 (0.83-1.05)	0.23	0.90 (0.80-1.01)	0.07	0.89 (0.80-1.00)	0.06
Pre-incarceration extra-medical methadone use	1.01 (0.91-1.13)	0.83				
Pre-incarceration prescribed methadone use	0.86 (0.69-1.06)	0.16	0.84 (0.67-1.06)	0.14	0.84 (0.69-1.08)	0.19
Pre-incarceration cocaine use	1.09 (0.98-1.22)	0.11	1.13 (1.01-1.27)	0.03	1.13 (1.01-1.26)	0.04
Number of prior incarcerations	1.00 (0.99-1.01)	0.79				
Used heroin in prison	1.00 (0.90-1.12)	0.96				
Injected any drug in prison	1.04 (0.93-1.17)	0.45				

CI=confidence interval. *Models stratified by release episode. [#]Time-dependent covariate.