High drug related mortality rates following prison release: Assessing the acceptance likelihood of a naltrexone injection and related concerns

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Declarations of interest

None

Abstract

Background and aims. High drug related mortality amongst former prisoners in the 4 weeks following release is an internationally recognised problem. Naltrexone injections at release could diminish this by blockading opioid receptors, but naltrexone is not licenced for injection for treating opiate misuse in the United Kingdom and some other countries. This study examined the likelihood of accepting a naltrexone injection at release, and the relationship of this likelihood to other relevant variables.

Method. Sixty-one male prisoners with a history of heroin use, who were approaching release from two prisons in the north-west of England, provided likelihood ratings for accepting a naltrexone injection if it were to have been available. Additional data was gathered regarding demographic and drug use histories, and also from psychometric instruments relevant to drug misuse and treatment preparedness.

Results. Maximum likelihood ratings for accepting a naltrexone injection were recorded by 55.7% of the sample with only 9.8% indicating no likelihood of accepting an injection. Likelihood ratings were positively related to serving a current sentence for an acquisitive offence compared to drug related or violence offences, and negatively related to peak methadone dosages during the current sentence.

Conclusions. Although naltrexone injections were not available to participants in this study, the findings suggest that the potential uptake for this intervention is sufficient to warrant a clinical trial with this population of British prisoners, with a view to potential changes to its current licencing status. However, the importance of individual patient readiness for such an abstinence orientated intervention is

emphasised by the negative correlation between the likelihood ratings and recent methadone doses.

Keywords

Heroin Prisoners Death Naltrexone Injections Readiness

1.0 Introduction

An elevated mortality rate for recently released prisoners with a history of opiate misuse, compared to the general population, has been highlighted by the World Health Organisation (2014). Evidence from several countries supports this observation, with causes of death related to opiate misuse being associated with elevated mortality in the first month following prison release (Binswanger et al, 2007, 2012; Farrell & Marsden, 2005, 2008; Huang et al., 2011; Kariminia et al., 2007; Singleton, Pendry, Taylor, Farrell, & Marsden, 2003), and particularly within the first 2 weeks since release (Merrall et al., 2010). In one study, newly released prisoners were reported to be approximately 40 times more likely to die in the week following release compared to the general population, with drug related causes being reported in approximately 90% of these deaths (Singleton et al., 2003). A combination of the diminution of opiate tolerance whilst incarcerated, and a hedonistic intention to enjoy newly re-acquired freedom, appears to be associated with this high prevalence of premature deaths (e.g. Binswanger et al, 2007; Merrall et al., 2010).

The misuse of drugs is acknowledged as a serious problem in the British criminal justice system, which was the context of the present study. In their most recent report to address this issue, the House of Commons Home Affairs Committee noted that 70% of offenders reported having misused drugs prior to prison admission, 51% of offenders were deemed to have drug dependency problems, and that 35% of offenders had engaged in injecting behaviour (House of Commons, 2012). Furthermore, one survey of British prisoners reported that 19% of those who declared that they had used heroin indicated that their first use of the drug occurred in prison (Prison Reform Trust, 2012). In response to this

situation, detailed clinical guidelines exist for the treatment of substance abuse problems in the prison population which acknowledge the importance of both maintenance and detoxification strategies in treatment, and which also address the need for careful management of the transition back from prison into the community (Clinical Guidelines on Drug Misuse and Dependence Update 2017 Independent Expert Working Group, 2017; NICE, 2007). These guidelines emphasise the importance of using opiate substitution treatment (OST) to maintain the stability of patients in prison, and that any change in treatment strategy to one of detoxification needs to be a matter of clinical judgement regarding the patient's readiness for this change, in the context of their willingness and ability to pursue such a strategy. The guidelines oppose an enforced removal of OST and the consequent imposition of opiate withdrawal on patients in prison, in line with evidence for the potential benefits to patients of continuing the availability of OST in prison (e.g. Rich et al., 2015). Whilst the United Kingdom Ministry of Justice acknowledges the role of OST in treating opiate dependence in prisons, it also advises that wherever possible, drug dependent prisoners be encouraged to pursue a recovery strategy in the form of drug abstinence (House of Commons, 2012). In considering the question of treatment for opiate misuse amongst prisoners more broadly, it is important to remember that the availability of OST will vary across national jurisdictions with, for example, limited availability in the United States (Maradiaga, Nahvi, Cunningham, Sanchez & Fox, 2016; Mitchell et al., 2009).

One intervention for minimising the risk of a post-release opiate overdose is the provision of the opiate antagonist naloxone and the equipment to inject it, so as to

counteract the overdose (Bird & Hutchinson, 2003; European Monitoring Centre for Drugs and Drug Addiction, 2018; Parmar, Strang, Choo, Meade, & Bird, 2016; Strang, 2015). However, this strategy does not diminish the likelihood of an overdose initially occurring, and relies upon either the user being sufficiently capable of self-administering the injection, or another person being present who is capable and willing to administer it. An alternative intervention is the administration of the opiate antagonist naltrexone to blockade μ-opiate receptors against exogenous opiates such as heroin, and consequently diminish the likelihood of positive reinforcement arising from their administration (Adi et al., 2007; Martin, Jasinski & Mansky, 1973; Schuh, Walsh & Stitzer, 1999). Oral administration of naltrexone can provide a dose dependent blockade of μ-opiate receptors for between 3 and 5 days, but there is evidence to indicate limited effectiveness for relapse prevention (Adi et al., 2007; Coviello, Cornish, Lynch, Alterman, & O'Brien, 2010; Minozzi et al., 2011), with high treatment drop-out rates being common. An alternative longer acting administration method for naltrexone is by implantation, but the effectiveness and acceptability to patients of this intervention compared to conventional treatments have not been clearly established (Larney et al., 2014; Lobmaier, Kunøe, Gossop, Katevoll, & Waal, 2010).

Slow release injectable naltrexone formulations offer an effective opiate receptor blockade for approximately 4 weeks, which has been shown to contribute to relapse prevention (Comer et al., 2002, 2006; Krupitsky & Blokhina, 2010; Krupitsky et al., 2011; Lobmaier et al., 2011; Sullivan et al., 2013; Wang et al., 2014). Consequently, a naltrexone injection at prison release may potentially

contribute to curbing post release elevated mortality. Contraindications for the use of naltrexone include impairments to both kidney and liver functioning (British National Formulary, 2017; Accord Healthcare, 2018). Trials of injectable naltrexone with newly released prisoners in the United States show it to be acceptable to some prisoners (Friedman, Wilson, Hoskinson, Poshkus & Clarke, 2018; Gordon et al., 2015; Lee et al., 2015; Vagenas et al, 2014) and effective in curbing relapse to opiate use. In one study, a second injection 4 weeks after release was shown to be effective in curbing relapse at an 8 week follow-up (Lee et al., 2015) in those participants remaining in the trial. Naltrexone is not currently licensed for injectable administration for treating opiate misuse in the United Kingdom and some other countries such as Holland, with no evidence therefore being available concerning its likely uptake by prisoners within these populations if it were to be available. However, Dutch patients in community based methadone maintenance (MMT) or heroin assisted treatment (HAT) who wished to become abstinent have expressed intended acceptance of this intervention (Zaaijer, Goudriaan, Koeter, Booij & van den Brink, 2016).

Whilst clinical trials have shown that naltrexone injections were acceptable to some prisoners at their time of release, the offer of this treatment was not universally accepted. For example, Gordon et al. (2015) reported that 45 potential participants declined to participate in their trial, compared to the 97 who did, constituting an approximate refusal rate of 31.7%. Lee et al (2015) reported the completion of consent procedures with 48 out of 142 potentially eligible participants (i.e. 33.8%), but procedural difficulties with screening make it difficult to identify a clearly defined refusal rate for this trial. Two other trials only report

details of participants who completed the consent procedures (Friedman et al., 2018; Vagenas et al (2014). The demonstrated effectiveness of the μ-opiate receptor blockade following a naltrexone injection (Sullivan et al., 2013; Wang et al., 2014) means that, at a subjective level, abstinence from the desired effects of opiate misuse is effectively being enforced for a 4 week period, and this may pose serious challenges to some potential participants which need to be understood at this early stage in the deployment of this intervention. The importance of the willing participation of prisoners in an abstinence orientated treatment makes this an important research question (Clinical Guidelines on Drug Misuse and Dependence Update 2017 Independent Expert Working Group, 2017).

Studies with prisoners approaching release have not so far examined the variables associated with the decision to accept injections of naltrexone or not. The present study attempted to examine some potentially relevant variables in a sample of British prisoners with a history of opiate dependence who were close to release into the community. It should be noted that this treatment option was not available to them at the time of data collection due to the licencing regulations for naltrexone in the United Kingdom. However, the research team considered that gathering such data at this time would not only demonstrate a willingness within this population to accept the treatment or not, but would also facilitate the delivery of the treatment in a timely manner if the licencing situation changed, due to the awareness available to treatment providers regarding variables which might be associated with the decision of prisoners to accept it or not.

The choice of instruments to be administered was guided by issues in treatment arising in the existing literature for other interventions and other treatment contexts. For example, motivation for treatment and confidence for being able to maintain abstinence constitute important elements of a drug dependent patient's psychological preparedness for treatment (Hampton et al., 2011; Murphy & Bentall, 1992; Murphy et al., 2003). Related to motivation and confidence are likely to be previous experiences of the challenges of maintaining abstinence such as the influence of heroin using associates (Liu et al., 2013; Mullen & Hammersley, 2006), coping with craving (Evren et al., 2014; Tasić, Valkanou, Đukanović, Banković, & Janjić, 2017), and coping with problems of mood (Hammerbacher & Lyvers, 2006; Min et al., 2011). Release into the community is also likely to mean a return to the social context where the prisoner will have been engaged in crime, with this engagement also having been a feature of their social networks, and which may have preceded the misuse of drugs (Allen, 2005; Bennett & Holloway, 2006; Kaye, Darke, & Finlay-Jones, 1998). Whilst engagement in, and convictions for, acquisitive crime to obtain financial support for heroin use, including the trafficking of drugs, has been well reported in the literature (Gossop, Trakada, Stewart & Witton, 2005; Stewart, Gossop, Marsden & Rolfe, 2000), the corresponding evidence for violent crime by heroin users has shown it to be present at a comparatively lower level (Butken et al., 2011; Håkansson & Berglund, 2012, Vorma et al, 2013). In short, the relationship between crime and drug misuse is complex, and elements of this relationship may potentially influence decisions to accept a naltrexone injection or not. Other life domains which may influence engagement with treatment include concern for one's health and/or family relationships (Murphy et al., 2003; Tseng, Hemenwa, &

Kawachi, & Subramanian, 2010; Weiss et al., 2014), and concomitant problems with alcohol and illegal drugs other than heroin (Fernández-Calderón, Fernández, Ruiz-Curado, Verdejio-García, & Lozano, 2015; Reissner et al., 2012).

In summary, the objective of this study was to obtain ratings of the likelihood of accepting a naltrexone injection at the time of prison release, if one were to have been available, and to examine the relationship of these ratings to variables representing aspects of drug dependence, criminal behaviour, and psychological preparedness to change substance using behaviours.

2.0 Method

2.1 Design and treatment context

This was an interview based study conducted in HMPs Liverpool and Kennet in the north-west of England where the treatment of prisoners with opiate dependence problems followed the national treatment guidelines for the United Kingdom. These guidelines encompass both maintenance and detoxification strategies, with all prisoners being screened for opiate misuse at admission. Those who prove positive for opiate misuse are offered immediate OST in order to stabilise patients their condition. In rare cases where OST is refused at admission, prison medical staff follow-up the initial contact in the days following admission to encourage acceptance of this treatment. The normal practice is to maintain a stabilised state for at least 3 months before encouraging these patients to attempt detoxification if clinical judgement deemed this to be appropriate, with a drug free state being the long term goal. Where patients were still in receipt of methadone at the time of their prison discharge, possibly due to

serving only a short sentence or because attempted abstinence was contraindicated, they are referred to community drug treatment agencies and narcotics anonymous for continuing care. Within this context, all participants in this study would have been stabilised on methadone as part of their current treatment plan before moving to a strategy of detoxification and abstinence. Where patients are abstinent at prison release, they are actively encouraged to seek support from community based agencies in order to maintain abstinence in the face of pressures to relapse to opiate misuse.

For the purposes of this study the intention was to recruit participants for whom the current strategic objective of treatment was abstinence upon release without OST, as determined by prevailing clinical procedures. Consequently, there was an inclusion criterion that methadone prescribing had either already been ceased for these prisoners, or that its cessation was planned to have been completed by the time of their release. This criterion was used to identify the potential participants to be targeted for recruitment to this study because they would be the potential candidates to receive naltrexone by injection, if it were to have been available, in order to provide additional support for the maintenance of abstinence after release, and therefore the consequent diminution of overdose risks. However, with no drug being administered in the present study, it was not possible to reproduce the conditions which would prevail for a clinical trial or treatment programme of injectable naltrexone, such as liver function tests and additional urine screening. Furthermore, in the absence of the funding arrangements which would support a clinical trial, the access of the research team to the prisoners was contingent upon the minimisation of additional work for

the prison medical team. Where their time permitted, the medical staff in both prisons identified patients who satisfied the inclusion criteria concerning the cessation of methadone, described above, and ascertained their willingness or otherwise to meet the researcher for an interview. However, they were not in a position to keep additional records of such approaches.

2.2 Participants

Sixty-one participants (all male) agreed to meet the member of the research team conducting the interviews (MW). In addition to the inclusion criterion described above concerning OST, an additional exclusion criterion had been that potential participants would not reasonably be expected to pose a threat to the safety of a female researcher. All the potential participants who agreed to meet the researcher completed the full research interview. Table 1 summarises participants' background measures with regard to age, opiate misuse histories, and sentencing histories.

Insert Table 1 about here

2.3 Materials and Measures

Participant Information Sheet. This explained the ability of one naltrexone injection to prevent psychoactive effects from heroin use for approximately 4 weeks. It was emphasised that no naltrexone injection would be available in this study, with the focus being upon how participants thought they would respond if an injection was available. However, this sheet did not explain the medical contraindications for this intervention because it was not possible to create the conditions under which such information is given within clinical trials. These

include the use of a test dose of oral naltrexone to examine potential adverse effects prior to commencing the injections (e.g. Gordon et al., 2015). The participant information sheet also explained the procedures for maintaining confidentiality and withdrawal from the study. The voluntary nature of participation was emphasised, along with the absence of both financial incentives for participation and penalties for not participating. Participants were informed they could proceed with the full interview now, decide not to participate, or wait for up to 2 days to decide to participate or not. This information sheet had a Flesch-Kincaid score of 9.7, compatible with a reading age of 13 to 14 years.

Background Information. Data concerning heroin consumption immediately prior to the current sentence were obtained using a brief questionnaire. However, participants' ages, longer-term opiate misuse histories and treatment details, were obtained from patient medical records held within the prison treatment facility, which were part of the national health service record system, rather than the criminal justice record system. However, a detailed history of substance misuse consumption was not sought because of the potential level of threat which participants might have experienced in providing such data, given their position within prison with the opportunity of discharge into the community approaching.

Naltrexone Treatment Questionnaire (NTQ). Participants rated the likelihood of being willing to receive an injection of naltrexone prior to prison release on a visual analogue scale. The left pole was labelled 'I would not accept this treatment' and the right pole was labelled 'I would certainly accept this treatment'.

The measures obtained represented the distance of responses from the left pole in millimetres (maximum 135 mm).

The Leeds Dependence Questionnaire (LDQ: Kelly, Magill, Slaymaker, & Kahler, 2010; Raistrick et al.,1994). Participants rated their substance use related thoughts and behaviours on 10 items concerning preparedness for treatment using a four point scale of 'Never', 'Sometimes', 'Often', and 'Nearly Always'. This instrument measures various elements of dependence upon a drug, such as continual thinking about its use, a perceived need to use it which is too strong to control, and perceived difficulty in daily functioning without its consumption.

Stages of Change Readiness and Treatment Eagerness Scale (SOCRATES 8A Personal Drinking Questionnaire, and 8D Personal Drug Use Questionnaire: Miller & Tonigan,1996). These two instruments derived from the transtheoretical model of change (Prochaska & DiClemente, 1986) addressed aspects of psychological preparedness to change consumption behaviours for alcohol and other drug use, respectively, including concerns over the harm these behaviours may be causing to self and others which may be motivational elements underpinning treatment choices. Each instrument contained 19 items, yielding scores on three scales (i.e. six scales in total) representing, respectively, recognition of an alcohol/drug problem, ambivalence regarding alcohol/drug use, and taking steps regarding alcohol/drug use. The response format for each item was a five point scale of 'No! strongly Disagree', 'No: Disagree', '?: Undecided or Unsure', 'Yes: Agree', and 'Yes! Strongly Agree'.

Drug-Taking Confidence Questionnaire (DTCQ-8: Sklar & Turner, 1999). Respondents imagined themselves reacting to a list of eight hypothetical situations of temptation to use heroin. Under the overall question 'I would be able to resist the urge to use heroin', each situation was rated on a six point scale with '0' labelled 'Not at all confident', and '100' labelled 'Very confident'. The intermediate points represented percentage estimates of confidence to resist using heroin labelled as '20', '40', '60', and '80', respectively. The hypothetical situations presented include social influences from heroin using associates.

2.4 Procedure

Interviews were conducted in the prisons' clinical facilities, with only the interviewee and interviewer (MW) present, and were divided into Part 1 and Part 2. In Part 1, participants read the Participant Information Sheet with the interviewer providing brief oral summaries to ensure correct understanding. Part 2 comprised administration of the measures listed above, in the order listed. Ethical approval for this study was obtained from an appropriate NHS Research Ethics Service Committee with a remit for prison based research, NHS Trusts providing clinical services in the participating prisons, the National Offender Management Service, and fro, the Edge Hill University (EHU) Faculty of Health and Social Care Research Ethics Committee.

2.5 Analytic Strategy

Data were stored and analysed using SPSS ™. An anonymised data file is available as supplementary information through the publisher's website. Data from the LDQ, SOCRATES, and the DTCQ-8 were labelled as treatment preparedness scores. Descriptive statistics for all variables included skewness

and kurtosis measures of approximation to a normal distribution, and the consequent appropriateness of parametric analyses (Tabachnick & Fidell, 2014). Bivariate correlations measured the relationship of naltrexone injection acceptance likelihood (NIAL) ratings to demographic and treatment preparedness variables. The type of offence for which participants were currently incarcerated constituted an independent variable for parametric ANOVAs and *post hoc* pairwise comparisons. Where nonparametric Kruskal-Wallis tests were necessary instead of ANOVAs, *post hoc* comparisons utilised Mann-Whitney *U* tests. In both cases, *post hoc* comparisons were evaluated as two-tailed against Bonferroni adjusted alpha levels. Results from bivariate correlations and ANOVAs informed the development of a predictive model for multiple linear regression analysis utilising NIAL ratings as the dependent variable. Squared semi-partial correlation coefficients (sr^2) for each independent variable made it possible to examine their relationship individually with the variability in the dependent variable (Tabachnick & Fidell, 2014).

Limitations to the NIAL ratings as a dependent variable are acknowledged as they essentially possess an ordinal level of measurement rather than a more robust interval level. One means of addressing this limitation would be to dichotomise the NIAL ratings to serve as a dependent variable in a logistic regression analysis. However, whilst acknowledging that the dichotomisation of a continuous variable may sometimes be useful, such a step can also produce a spurious result with regard to the creation of an arbitrary dichotomy where the variability of scores is ignored so that participants close to, but on opposite sides of the cut-off point, are assumed to be different on the variable in question to the same extent as

participants with either the lowest or the highest scores, respectively (Altman & Royston, 2006; Iacobucci, Posavac, Kardes, Schneider & Popovitch, 2015). Consequently, the decision to include such a logistic regression analysis or not was made dependent upon the obtained distribution of NIAL scores.

3.0 Results

3.1 Background variables and treatment preparedness measures

Details of participants' ages, opiate misuse histories, and sentencing histories are shown in Table 1, whilst Table 2 shows the four categories of offence identified for which participants were currently incarcerated, with scores for the treatment preparedness measures broken down by these four groups. The miscellaneous offences group was omitted from inter-groups analyses because of its small size. The Bonferroni adjusted alpha level was therefore ά = .017.

Insert Table 2 about here

Table 2 shows no significant effects for the LDQ, SOCRATES drug problem scales, or the DTCQ-8. Significant inter-group effects were found on each of the SOCRATES alcohol problem scales. The violent offences group scored significantly higher than the drug misuse offences group for 'recognition of an alcohol problem' (P = .009, two tailed), and for 'ambivalence regarding an alcohol problem' (P = .011, two tailed). No other comparisons were significant for these scales. For the 'taking steps regarding an alcohol problem' scale, the violent offences group scored higher than both the drug misuse offences (P = .003, two-tailed), and the acquisitive offences group (P = .011, two tailed). The remaining pairwise comparison was nonsignificant.

3.2 Naltrexone injection acceptance likelihood (NIAL) ratings

The mean NIAL visual analogue scale rating was 76.6 mm (*SD* = 32.5 mm), ranging from 0 mm to the maximum rating of 135 mm. The median and mode scores were both 135 mm. Only 6 participants (9.8%) recorded NIAL ratings of 0 mm., with the ratings for a further 13 participants (21.3%) falling below the equal likelihood rating of 67.5 mm. In total therefore, 19 participants (31.1%) recorded NIAL ratings below the point of equal likelihood. Forty-two participants (68.9%) recorded NIAL ratings beyond the equal likelihood rating of 67.5 mm, with 8 participants (13.2%) recording ratings between the equal likelihood point and 90.0 mm. Beyond this point on the scale, the remaining 34 (55.7%) participants recorded maximum NIAL ratings of 135 mm. Table 2 reports a significant main effect for NIAL ratings across the three offence groups included in the nonparametric ANOVA. The only significant *post hoc* comparison showed that the acquisitive offences group had significantly higher ratings than the drug misuse offences group (U = 152.5, p = .013, two tailed). From the other variables detailed in both Tables 1 and 2, only the highest daily methadone dosage during the current sentence (r_s (61) = -.256, p = .046, two tailed) was correlated with NIAL ratings.

The linear regression model utilised a binary independent variable of ‘acquisitive offence or not’ for Model 1, as this group had the highest NIAL ratings of the three main offences group. All 61 participants were included in this binary coding. Using hierarchical variable entry, ‘highest daily methadone dosage during the current sentence’ was added as an independent variable for Model 2 due to its significant correlation with the dependent variable. Both models significantly predicted NIAL

ratings. For Model 1, R^2 = .089 (F (1, 59) = 5.794, P = .019). For Model 2 there was a small increase in the proportion of variance in NIAL ratings explained, with R^2 = .110 (F (2, 58) = 3.583, P = .034), but this increase was nonsignificant (F change (1, 58) = 1.339, *ns.*). Table 3 shows that 'Acquisitive crime or not' was a significant predictor of NIAL ratings in both models, with the positive *B* coefficient indicating that membership of this offender group was associated with higher ratings. Obtained *z*-scores for skewness and kurtosis for unstandardized residuals for both models showed no significant deviation from a normal distribution. Residual plots showed no indication of curvilinearity or heteroscadesticity. *Post hoc* statistical power calculations for f^2 = 0.35 were 0.995 for Model 1 and 0.986 for Model 2 (Faul & Eerdfelder, 1992).

Insert Table 3 about here

The distribution of NIAL ratings showed a clear dichotomy between participants with maximum ratings of 135 mm (n = 34), and the remainder of the sample (n = 27) for whom the highest rating was 90 mm. It was considered that this dichotomy constituted a clear and potentially meaningful outcome at a psychological level, so that we proceeded with a logistic regression analysis utilising maximum NIAL ratings or not as a dichotomous dependent variable. This analysis utilised Models 1 and 2 as described above (see Table 4). The correct prediction percentage for Block 0 (i.e. random prediction) was 55.7%. There was a nonsignificant rise to 60.7% correct prediction for Model 1 (Model χ^2 [1 (N = 61)] =2.884, P = .089), whilst Model 2 raised the correct prediction percentage to 62.3% which was significantly higher than for Block 0 (Model χ^2 [2 (N = 61)] = 5.993, P = .050). The positive *B* coefficients for 'acquisitive crime or not' show that membership of this

group was associated with maximum NIAL ratings, although the Wald chi-square results were nonsignificant regarding prediction of the dependent variable.

Insert Table 4 about here

4.0 Discussion

Clinical trials conducted in the United States have shown that some prisoners with a history of opiate misuse who are approaching release into the community are willing to accept a naltrexone injection, but that acceptance of this treatment is not universal (Gordon et al., 2015; Lee et al., 2015). The present findings indicate a strongly positive response from a comparable sample of British prisoners regarding their willingness to receive a naltrexone injection if one were to have been available at their time of release. More than half of the sample recorded a maximum likelihood rating that they would accept such an injection, despite being aware that it would prevent them from experiencing a 'high' resulting from the use of heroin for up to 4 weeks thereafter. This finding suggests that the likely acceptance of this intervention exists in licencing jurisdictions where it is not currently permitted, outside the United States. However, as this intervention was not available to the present participants, the implications of this finding are necessarily limited. In particular, there is a strong need for caution around the assumption that actual behaviour would correspond to intentions stated at a time when there was no possibility of being required to follow through with a behavioural commitment to pursue an intervention which would effectively prevent the sought after effects of opiate consumption.

One further limitation to the current findings is that despite being statistically significant, only 11.0% of variability in NIAL ratings was explained by Model 2 in the linear regression. It is possible that the high proportion of maximum NIAL ratings created a ceiling effect which consequently limited the possibility of variability being shared between the treatment preparedness and other measures as independent variables, and the NIAL ratings as the dependent variable in this analysis. Despite satisfactory *post hoc* statistical power for the multiple linear regression, the present study would have benefited from having a larger sample size to facilitate the exploration of the bivariate relationships between the treatment preparedness and other variables, and the willingness to accept a naltrexone injection. The size of the present data set renders it unclear as to whether the reported paucity of significant bivariate correlations in these results is due to a ceiling effect concerning the NIAL ratings, or a need for greater statistical power. The significant negative correlation between the highest methadone dosage received during the current sentence and the NIAL ratings raises questions concerning participants' perceptions' of their readiness to change from OST to an abstinence orientated treatment strategy. Indeed, the zero NIAL ratings by given by some participants could be indicative of a reluctance to commit themselves entirely to treatment goal of abstinence. Whilst some patients receiving OST may feel ready to change to an abstinence orientated treatment strategy (see also Zaaijer et al., 2016), the continuation of OST has been demonstrated to have potential health benefits for prisoners with a history of opiate misuse (e.g. Rich et al., 2015), and the importance of clinical judgement regarding the readiness of such prisoners to change to an abstinence treatment strategy, and the prisoners own active engagement with such a strategy, must be

remembered (Clinical Guidelines on Drug Misuse and Dependence Update 2017 Independent Expert Working Group, 2017). The provision of information to prisoners regarding the possible side effects of naltrexone and appropriate clinical screening procedures would also be required as part of their preparation for the administration of this treatment (British National Formulary, 2017; Accord Healthcare, 2018).

Serving a current sentence for an acquisitive crime compared to a drug misuse, violent, or miscellaneous offence, was the strongest predictor of high NIAL ratings. With acquisitive crimes often committed to support heroin use (Gossop et al., 2005; Stewart et al., 2000), this result may indicate greater willingness in this offender group to accept an intervention which will remove any reason to find money to acquire heroin, compared to the other offender groups. It should be noted that higher post release mortality has previously been reported for this offender group than for other types of offences (Farrell & Marsden, 2005). With regard to the violent offences group, it is noteworthy that they scored significantly more highly than the drug misuse offences group on all three SOCRATES alcohol scales, and more highly than the acquisitive offences group on the 'taking steps' alcohol scale. Violent offences have been reported to be uncharacteristic of heroin users except in situations of desperation for money to obtain the drug (Butken et al., 2011; Håkansson & Berglund, 2012, Vorma et al, 2013), and possibly more characteristic of cocaine and alcohol use (Stewart et al., 2000). It is possible, therefore, that prisoners with opiate misuse problems who are serving sentences for violent offences may be more likely than other prisoners with opiate misuse problems to have concurrent problems with alcohol, and possibly other

substances, and to be relatively less willing to accept a naltrexone injection than their counterparts who are serving sentences for acquisitive crimes. However, although the concomitant use of alcohol and other drugs with heroin is noted in the literature (e.g. Fernández-Calderón et al., 2015; Reissner et al 2012), this point cannot be pursued further with the current data set due to the lack of data concerning the consumption of other substances arising from the context of data collection for this study:

Whilst issues of sample size and the absence of naltrexone injections for the participants in this study place some limitations on the application of the present findings, there are nevertheless some potentially important implications arising from this study with regard to the deployment of this intervention. In particular, it appears likely that where opiate abstinence at prison release was deemed to be an appropriate option, there would be a worthwhile number of British prisoners who have received treatment for heroin use during their current sentence willing to come forward, in order to justify either a trial of this intervention to be conducted within the United Kingdom, or for the current licencing situation for naltrexone to change in order to permit the availability of this intervention. In this sense, the present findings constitute a ‘proof of concept’ for this intervention with this population of prisoners for whom it is currently unavailable. Rather than being solely a British situation, it should be remembered that the post release elevation of mortality for this population of prisoners has been noted in many countries (World Health Organisation, 2014), so that the existence or not of a willingness to accept this intervention, and the identification of issues associated with its acceptance or refusal, is a matter of interest internationally with regard to

changes in treatment provision and/or regulation in jurisdictions more broadly where injectable naltrexone for the treatment of opiate misuse is currently unavailable.

Whilst the practice in the prisons participating in this study was to stabilise opiate dependent prisoners on OST before consideration of a change of treatment strategy towards abstinence, it is noted that within some jurisdictions such as the United States, OST has limited availability within prisons, and that the experience of enforced opiate withdrawal arising in this context can militate against some prisoners being willing to accept OST in the future where it is available (Maradiaga et al., 2016; Mitchell et al., 2009). Enforced withdrawal in prison would lead to a reduced opiate tolerance upon release, which is one of the conditions associated with an increased risk of death from opiate overdose in the immediate period following prison release (Binswanger et al, 2007, 2012; Merrall et al., 2010). Within the British context where OST is available in prisons, the clinical experience available within the present research team indicates that very few prisoners refuse this treatment, although we are unaware of any comprehensive or systematically gathered data on this point. Whilst noting the benefits of OST availability within prisons (Rich et al., 2015), where such treatment remains unavailable, there is still a potential role for injectable naltrexone to be offered as a support for post-release abstinence.

In conclusion, an effective response to the problems related to opiate misuse requires a battery of interventions which can be drawn upon as appropriate. Injections of naltrexone provide one clinical means of potentially reducing drug

related elevated mortality rates in prisoners in the 4 weeks following their release into the community, and its availability as an option to prevent unnecessary deaths does not preclude the provision of other interventions such as ‘take-home’ naloxone supplies (European Monitoring Centre for Drugs and Drug Addiction, 2018; Strang, 2015). It is recommended that further investigations take place into the effectiveness of naltrexone injections as an intervention for the population of heroin users facing release from prison, and into the regulatory changes which may be necessary for its implementation.

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Table 1

Participants' age, opioid misuse, and incarceration details for Study 1

Variable	Mean	*SD*	Range
Current age (years)	37.8	6.8	23 to 55 years
Heroin use onset age (Years)	20.8	6.5	11 to 51 years
Time elapsing since heroin use onset (Years)	17.0	8.6	1 to 31 years
Number of overdose episodes experienced	1.6	4.0	0 to 20 episodes
Highest daily methadone dosage in current sentence (*mg*)	53.0	33.4	0 to 180 *mg*
Length of current sentence (months)[1]	30.8	23.2	1 to 84 months
Current sentence served (weeks)[2]	56.5	98.2	1 to 634 weeks
Number of previous custodial sentences	15.4	21.3	0 to 99 previous sentences

[1] Excludes 10 prisoners on remand in custody. [2] Includes prisoners on remand.

Table 2

Scores for the treatment preparedness measures and likelihood ratings for accepting injectable naltrexone across participant offence groups

Preparedness measure	Acquisitive offence Mean (*SD*) *n* = 30	Drug misuse offence Mean (*SD*) *n* = 17	Violent offence Mean (*SD*) *n* = 10	Miscellaneous offences Mean (*SD*) *n* = 4	ANOVA[1] (excluding the miscellaneous offences group)
Leeds Dependency Questionnaire (min = 0: max = 30)	11.40 (7.31)	6.82 (7.10)	7.50 (6.72)	4.25 (3.30)	$F(2, 54) = 2.626$ *ns*.
SOCRATES: recognition of an alcohol problem (min = 5: max = 35)	16.33 (11.76)	12.77 (9.66)	24.60 (10.63)	11.50 (9.00)	$F(2, 54) = 3.691$ $P = .031$, $\eta_p^2 = .120$
SOCRATES: ambivalence regarding an alcohol problem (min = 4: max = 20)	8.90 (6.29)	6.71 (5.28)	12.90 (5.45)	6.50 (5.00)	$F(2, 54) = 3.507$ $P = .037$, $\eta_p^2 = .115$
SOCRATES: taking steps regarding an alcohol problem (min = 8: max = 40)	19.33 (13.50)	15.65 (12.63)	32.00 (13.00)	12.75 (9.50)	$F(2, 54) = 5.089$ $P = .009$, $\eta_p^2 = .159$
SOCRATES: recognition of a drug problem (min = 5: max = 35)	29.10 (8.92)	27.59 (7.34)	30.20 (6.81)	26.75 (9.95)	χ^2 [2, $N = 57$] = 2.536, *ns.*
SOCRATES: ambivalence regarding a drug problem (min = 4: max = 20)	15.73 (4.28)	14.88 (2.50)	15.30 (3.23)	14.75 (4.11)	χ^2 [2, $N = 57$] = 2.164, *ns.*
SOCRATES: taking steps regarding a drug problem (min = 8: max = 40)	35.97 (7.01)	36.06 (4.70)	37.70 (3.68)	34.75 (10.50)	χ^2 [2, $N = 57$] = 1.049, *ns.*
DTCQ-8 (min = 0: max = 100)	62.08 (25.23)	60.88 (28.78)	76.51 (22.99)	63.13 (40.28)	F (2, 54) = 1.359, *ns.*
Highest methadone dosage for current sentence (mls)	49.83 (36.35)	61.77 (36.18)	47.00 (11.83)	53.75 (39.03)	χ^2 [2, $N = 57$] = 1.484, *ns.*
Likelihood of accepting injectable naltrexone ratings (mm: min = 0: max = 135)	110.50 (38.06)	75.59 (50.65)	80.50 (59.65)	113.75 (42.50)	χ^2 [2, $N = 56$] = 6.652, $P = .036$

[1] The choice of parametric or nonparametric ANOVA was based upon the extent of deviation from a normal distribution of scores. Where appropriate the Kruskal-Wallis nonparametric ANOVA was performed. The miscellaneous offences group was omitted due to its small size.

Table 3

Hierarchical multiple linear regression results for independent variables within models[a]

Independent variables	**Unstandardised *B***	***t* - test**	***sr*^{2} [b]**
Model One: Acquisitive crime or not	28.403	*t* (59) = 2.407, *P* = .019	.089
(Constant)	(82.097)		
Model Two: Acquisitive crime or not	27.138	*t* (58) = 2.297, *P* = .025	.081
Highest methadone dose during current sentence	-0.206	*t* (58) = -1.157, *ns.*	.021
(Constant)	(93.637)		

[a] Dependent variable: likelihood ratings for accepting injectable naltrexone prior to prison release.
[b] Squared semi-partial correlation coefficient

Table 4

Hierarchical logistic regression results for independent variables within models[a]

Independent variables	*B*	Wald χ^2(1 *df*)	*P*	Exp (*B*)
Model One				
Acquisitive crime or not	.887	2.809	.094	2.429
(Constant)	(-.194)			
Model Two				
Acquisitive crime or not	.850	2.446	.118	2.340
Highest methadone dose during current sentence	-.015	2.678	.102	.985
(Constant)	(.630)			

[a] Dependent variable: Maximum likelihood rating of accepting injectable naltrexone at prison release, or not.