The Effectiveness of a Peer-Supporter Programme to Manage Opiate Misuse in England

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Submitted: 6 Jan 2022

Abstract Word Count: 250

Body Word count: 2086

Abstract

Objectives

This study aims to understand the factors associated with treatment programme success and determine the effectiveness of a peer mentor support programme. This shall be done by looking at three aims:

1. Does the duration of an individual’s opiate use before entering therapy, and their injecting history have an association with treatment programme success?
2. Does the peer mentor programme affect relapse to opiate use following treatment discharge?
3. Does the peer mentor programme affect social wellbeing one year following treatment discharge?

Methods

A randomised control trial assigned 864 individuals to either the peer mentor support programme or the standard of care following discharge from rehab. Patients were recruited in 2017 and followed for 720 days. Logistic regression was used to assess programme success under aim one. Cox regression was used to assess an individual's odds of relapse under aim two. Linear regression was carried out to assess wellbeing under aim three.

Results

Compared to an identical individual who has never injected opioids, those who previously injected opioids will have 0.341 (95%CI 0.239, 0.483) times the odds of rehab success and those who previously injected opioids will have 0.427 (95%CI 0.308, 0.592) times the odds of rehab success. Relapse hazard for individuals in the peer mentoring group from 0-120 days is 0.902 (95%CI: 0.693, 1.174) times that of someone receiving the standard of care. Those who are in the peer mentoring group after 120 days have a further 0.610 (95%CI: 0.407, 0.913) times the hazard ratio compared to 0–120 days. Individuals in the Standard of Care group had an expected wellbeing of 44.581 (95%CI: 42.833, 46.329). Identical individuals in the peer mentoring group have an estimated wellbeing of 0.562 (95%CI: -1.222, 2.346) more.

Conclusion

Individuals’ injecting status and duration of use are associated with therapy success, and peer mentors have an association with reduced relapse hazard. There is insufficient evidence to suggest peer mentors effect an individual wellbeing after one year.

1. Introduction

Misuse of prescription opioids in England is nearing a public health emergency. Prescriptions for chronic pain over doubled from 2012 to 2018, while deaths increased from 1100 to over 2200. Furthermore, opiate misuse can negatively impact an individual's health, work, relationships and potentially lead to homelessness.

2. Methods

* 1. Data Processing

The dataset contained 864 observations, including some missing values and some individuals lost to follow-up. The study population was individuals from England located in the North West, South East, West Midlands or North East. Individuals were enrolling for rehabilitation treatment between April 2017 and August 2017. They were referred to therapy by various sources, and they come from various demographic groups. The exclusion criteria for this analysis was those under 16 since they lack medical autonomy[1]. However, data was only collected for individuals aged 20 to 85, so age did not exclude any values.

Once individuals were randomly assigned to a group, the two interventions groups had similar distributions of people.

* + 1. Eliminating Cases.

Due to being a randomised control trial, the data is time-series. However, 49 observations do not have any follow up. The analysis was carried out with intention to treat analysis because it is less prone to bias.

* + 1. Eliminate missing injecting status

These cases are likely to be missing not at random (MNAR) [2]. The distributions of each injecting status show that the missing values do not appear random and show lower wellbeing scores, fewer days before a relapse, and more likely to drop out of the study early.

* + 1. Impute missing wellbeing scores

These values will be imputed via multiple imputations since they are missing at random (MAR). This assumption was made since it is a score calculated with other variables. Therefore, it is likely to depend on the outcomes of other variables in the dataset as there is some overlap like housing. Since the score is based on many other variables, the score is arbitrary enough that it is unlikely the missing values will be based on the wellbeing score itself. However, a sensitivity analysis will be essential to assess the robustness of the results. The 'mice' package was used to generate five datasets. For the analysis of aim 3, each dataset will be used to perform the t-test, the results will be combined using Ruben's rules.

* 1. Data Analysis
     1. Aim 1: Programme Success

The outcome variable for the first aim is the binary variable ‘Rehab Success’, indicating whether the individual abstained from opiate use through the duration of the rehabilitation therapy programme. The exposure variables are the duration of opiate use before treatment in months, and injecting history,

which determines whether an individual has injected, does inject now, or has never injected.

Two testable hypotheses were developed.

H0: Duration of opiate use before treatment is not associated with programme success.

H0: Injecting history is not associated with programme success.

Two logistic regressions were carried out to test this hypothesis.

* + 1. Aim 2: Days before relapse

The outcome variable for the second aim is days without relapse. This is the number of days since therapy the individual went without relapsing. The study ended at 720 days; those who remained in the study and did not relapse have a time of 720 days. The exposure variable is the intervention type, which indicates whether an individual is on the peer mentor support programme or receiving the standard of care.

A testable hypothesis was developed.

H0: Enrolment on the peer mentor programme does not affect relapse following treatment discharge

A Cox regression was developed to test this hypothesis. As part of the EDA, Kaplan-Meiers plotted and showed a severe violation of the proportion of hazards assumption. A time split was implemented to the cox model at 120 days to ensure the proportion of hazards was not violated.

* + 1. Aim 3: Wellbeing

The outcome variable for the third aim is wellbeing, a variable that measures an individual's wellbeing one-year post-therapy. Wellbeing is impossible to assign a definite value to, so the wellbeing score is a standardised continuous variable computed from an individual's quality of employment, housing, social relationships and connectedness, and mental health. The exposure variable for this aim was the intervention type.

A testable hypothesis was developed.

H0: Enrolment on the peer mentor programme does not affect an individual’s wellbeing a year following discharge.

A simple linear regression is used to perform a t-test for this hypothesis.

3. Results

* 1. Aim 1: Programme Success

The logistic regressions were carried out. The odds ratios were calculated to increase the interpretability of the results by taking the exponential of the coefficient.

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| --- | --- | --- | --- |
|  | Exp(coef) | 95% CI | P-value |
| Intercept | 2.290 | (1.830, 2.884) | < 0.001 |
| Injecting Status: Currently Injecting | 0.341 | (0.239, 0.483) | < 0.001 |
| Injecting Status: Previously Injected | 0.427 | (0.308, 0.592) | < 0.001 |

Figure xxx shows the results for the logistic regression on injecting status. Those who currently injected opioids will have 0.341 (95%CI 0.239, 0.483) times the odds of having rehab success compared to an identical individual who has never injected opioids. Those who previously injected opioids will have 0.427 (95%CI 0.308, 0.592) times the odds of having rehab success compared to an identical individual who has never injected opioids.

There is sufficient evidence to reject the null hypothesis, which suggests that an individual's injecting status does affect their likelihood of rehab success.

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| --- | --- | --- | --- |
|  | Exp(coef) | 95% CI | P-value |
| Intercept | 1.564 | (1.288, 1.903) | < 0.001 |
| Duration of Use (months) | 0.990 | (0.982, 0.997) | 0.007 |

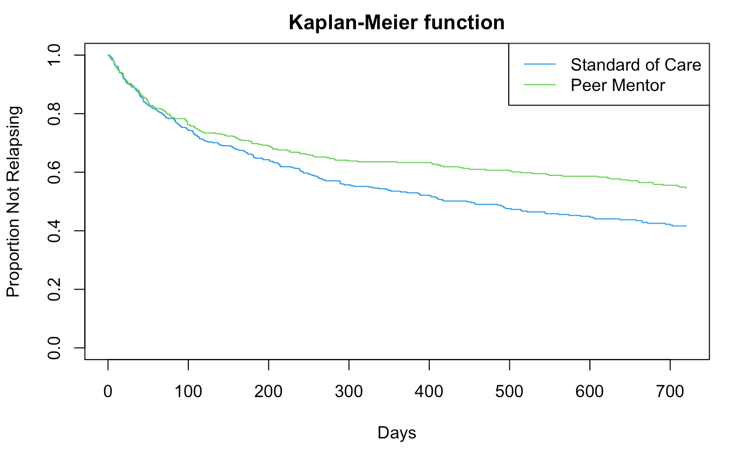
The baseline group is those whose duration of use is 0 months. Those who abused opioids will have 0.990 (95%CI 0.982, 0.997) times the odds of having rehab success compared to an identical individual who abused opioids for one month less.

There is sufficient evidence to reject the null hypothesis, which suggests that an individual's duration of use does affect their likelihood of rehab success.

The assumptions of these models have not been violated. Observations should be independent of each other. Each of the cases was individually referred for therapy. While it is possible the people in the study know each other and one person relapsing could affect another, the likelihood is small as it is a relatively small sample size relative to the population.

A sensitivity test was conducted to confirm the robustness of the findings. An additional model was developed containing an extra exposure for each regression, and another model was produced using multiple imputations to impute five sets of data for the missing injecting statuses. Neither of these models substantially changed the coefficients or confidence intervals (supplementary material), indicating robust estimates.

* 1. Aim 2: Days before relapse



A Kaplan-Meier curve was plotted to assess the proportion of hazards between those who received peer mentors and those who received standard of care. It flags a severe violation where the hazard ratio in the first 120 days differs from the subsequent days. This violation is confirmed by running a cox regression with intervention as the only exposure with no time split. The Schonefeld test gives a p-value of 0.027, is less than 5%, implying a violation of the assumptions. Looking at the Kaplan-Meier Function, days 0 – 120 appear to have little to no difference (proportion of 1). However, beyond 120 days, there appears to be an effect of being in the peer mentoring group. A time split was added at 120 days.

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| --- | --- | --- | --- |
|  | exp(coef) | 95% CI | P-value |
| Intervention: Peer Mentoring | 0.902 | (0.693, 1.174) | 0.444 |
| Intervention: Peer Mentoring and over 120 days | 0.610 | (0.407, 0.913) | 0.016 |
| Schoenfeld Test P value: | | 0.88 | |

This means that the relapse hazard for individuals in the peer mentoring group from 0-120 days is 0.902 (95%CI: 0.693, 1.174) times that of someone receiving the standard of care. Those who are in the peer mentoring group after 120 days have a further 0.610 (95%CI: 0.407, 0.913) times the hazard ratio compared to the 0 – 120 day period.

The p-values show that the use of peer mentors show no difference in the days before relapse during the time 0 – 120 days. After 120 days, the expected relapse hazard of individuals with peer mentors is lower than those without peer mentors.

A sensitivity test was conducted to confirm the robustness of the findings. An additional model was run containing an extra exposure. This did not substantially change the estimates (supplementary material), indicating the estimates are robust.

* 1. Aim 3: Wellbeing

The regression was carried out five times, each using one imputed set of missing values alongside the dataset. The estimates were pooled together with Rubens rules.

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|  | estimate | 95% CI | P-value |
| Intercept | 44.581 | (42.833, 46.329) | < 0.001 |
| Intervention: Peer Mentoring | 0.562 | (-1.222, 2.346) | 0.536 |

An individual in the Standard of Care group (baseline) has an expected wellbeing score of 44.581 (95%CI: 42.833, 46.329). An identical individual in the peer mentoring group would have an estimated wellbeing score of 0.562 (95%CI: -1.222, 2.346) more. These results suggest that there is not sufficient evidence to reject the null hypothesis.

The model assumptions were satisfied. Under section 3.1, independence was established. Residual plots were made, confirming homoscedasticity, normality, and linearity.

A sensitivity analysis was performed. The data was processed on the assumption that it was missing completely at random, so a complete case analysis was used by running another regression using just the complete cases. Additionally, another regression was run with an extra exposure variable. The result shows that the estimates were barely affected, indicating robust findings (supplementary material).

4. Conclusion

* 1. Hypotheses Recap

Under aim 1, there was sufficient evidence to reject both null hypotheses. This means that there is sufficient evidence to suggest that duration of opiate use before treatment and injecting history are associated with programme success.

Under aim 2, there was sufficient evidence to reject the null hypothesis. This means that there is sufficient evidence to suggest that the intervention type affects the relapse time.

Under aim 3, there was not sufficient evidence to reject the null. This suggests that intervention does not affect an individual's wellbeing score after one year.

* 1. Future Implications

Doctors and medical professionals should receive additional training and be encouraged to avoid prescribing injectable forms of opioids if there is an appropriate alternative. They should also be trained on decreasing the timespan a patient requires opioids by looking to end the course of opioids as soon as the pain subsides or by offering alternate ways of speeding up recovery.

Health professionals should attempt to identify cases of opioid addiction early. Regular check-ups on those prescribed opioids and check-ups after the course of opioids finishes could help identify those with early signs of addiction.

Peer mentors could be implemented as an intervention. However, more research should be conducted on the effect of peer mentors. Specifically looking at why the first 120 days with a peer mentor showed no improvement; is the peer mentor ineffective initially because they are new to the patient and need to build rapport, or is an individual is more volatile just after discharge? This research would help with future resource allocation.

* 1. Limitations

A limitation of the study is that it focused on just four regions of England: North West, South East, West Midlands and North East. Since England comprises nine regions [2], results may not be generalisable across the country in areas such as London and the East Midlands.

A further limitation of the analysis is the potential influence from bias. While techniques have been implemented to try and minimise the impact, it should still be noted.

Some individuals had no follow-up; these individuals were left in the analysis, potentially leading to more conservative estimates. Per protocol analysis could have been used, but this would potentially increase (attrition) bias.

Some values in the dataset had a missing injecting status, so the rows were eliminated. Since there is a stigma around injecting, these may be all people currently injecting; the boxplots showed that the missing group most closely resembled the currently injecting group. This is potentially a source of response bias. Medical professionals could have inspected individuals for injecting marks/scars or looked back on their medical records to minimise the recall bias. Since only 14 values are missing, it should not significantly impact the results.

The wellbeing variable was computed by an algorithm looking at several other measurable factors. No studies have shown that this algorithm adequately represents wellbeing, so research should be conducted to confirm its validity.

Since interventions have been shown to affect the probability of relapse but not the wellbeing of an individual after a year, further research needs to be conducted on the link between an individual's wellbeing and drug use.

References

1. https://www.nhs.uk/conditions/consent-to-treatment/children/
2. <https://www.ons.gov.uk/methodology/geography/ukgeographies/eurostat>
3. Imputing MNAR is beyond the scope of the course.

Aim 1 Sensitivity Tests

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| --- | --- | --- | --- |
| Injecting Status on Programme Success (with extra exposure) | | | |
|  | Exp(coef) | 95% CI | P-value |
| Intercept | 2.098 | (1.535, 2.888) | < 0.001 |
| Injecting Status: Currently Injecting | 0.336 | (0.235, 0.477) | < 0.001 |
| Injecting Status: Previously Injected | 0.426 | (0.306, 0.589) | < 0.001 |
| Gender | 1.134 | (0.824, 1.559) | 0.437 |

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| Injecting Status on Programme Success (with imputation) | | | |
|  | Exp(coef) | 95% CI | P-value |
| Intercept | 2.290 | (1.824, 2.874) | < 0.001 |
| Injecting Status: Currently Injecting | 0.341 | (0.240, 0.484) | < 0.001 |
| Injecting Status: Previously Injected | 0.427 | (0.308, 0.593) | < 0.001 |

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| Duration of Use on Programme Success (with extra exposure) | | | |
|  | Exp(coef) | 95% CI | P-value |
| Intercept | 1.544 | (1.142, 2.096) | < 0.001 |
| Duration of Use (months) | 0.990 | (0.982, 0.997) | 0.007 |
| Gender | 1.017 | (0.746, 2.384) | 0.914 |

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| Intervention against observed days without relapsing (with an extra exposure) | | | |
|  | exp(coef) | 95% CI | P-value |
| Intervention: Peer Mentoring | 0.970 | (0.703, 1.338) | 0.851 |
| Intervention: Peer Mentoring and over 120 days | 0.631 | (0.419, 0.952) | 0.028 |
| Gender | 1.049 | (0.836, 1.316) | 0.682 |
| Schoenfeld Test P value: | | 0.89 | |

Aim 2 Sensitivity Test

Aim 3 Sensitivity Tests

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| Intervention against wellbeing (with extra exposure) | | | |
|  | estimate | 95% CI | P-value |
| Intercept | 42.715 | (40.468, 44.961) | < 0.001 |
| Intervention: Peer Mentoring | 0.535 | (-1.244, 2.314) | 0.555 |
| Gender: Male | 2.55 | (0.599, 4.507) | 0.011 |

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| --- | --- | --- | --- |
| Intervention against wellbeing (complete case analysis) | | | |
|  | estimate | 95% CI | P-value |
| Intercept | 45.315 | (44.020, 46.610) | < 0.001 |
| Intervention: Peer Mentoring | 0.612 | (-1.227, 2.466) | 0.511 |