

## **Substance use outcomes following treatment : findings from the Australian Patient Pathways Study**

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Substance use outcomes following treatment: findings from the Australian Patient Pathways Study.

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SHORT TITLE: Outcomes from the Patient Pathways Study

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## **Abstract**

### **Background and Aims**

Our understanding of patient pathways through specialist Alcohol and Other Drug (AOD) treatment and broader health/welfare systems in Australia remains limited. This study examined how treatment outcomes are influenced by continuity in specialist AOD treatment, engagement with non-AOD community services, and mutual aid, as well as exploring differences between clients who present with a primary alcohol problem compared to those presenting with a primary drug issue.

### **Method**

In a prospective, multi-site treatment outcome study, 796 clients from 21 AOD services in Victoria and Western Australia completed a baseline interview between January 2012 and January 2013. 555 (70%) completed follow-up assessment of subsequent service use and AOD use outcomes 12-months later.

### **Results**

Just over half of the participants (52.0%) showed reliable reductions in use of, or abstinence from, their primary drug of concern. This was highest among clients who reported meth/amphetamine (66%) as their primary drug of concern and lowest among those who reported alcohol (47%), with 31% achieving abstinence from all drugs of concern. Continuity of specialist AOD care was associated with higher rates of abstinence than fragmented AOD care. Different predictors of treatment success emerged for clients with a primary drug problem as compared to those with a primary alcohol problem; mutual aid attendance (OR=2.5) and community service engagement (OR=2.0) for clients with alcohol as PDOC, and

completion of the index treatment (OR=2.8) and continuity in AOD care (OR=1.8) for those with primary drug issues.

### **Conclusion**

This is the first multi-site Australian study to include treatment outcomes for alcohol and cannabis users, who represent 70% of treatment seekers in AOD services. The results suggest a substantial proportion of clients respond positively to treatment, but that clients with alcohol as their primary drug problem may require different treatment pathways, compared to those with illicit drug issues, to achieve desirable outcomes.

**Keywords:** Alcohol, drug, treatment outcomes, substance dependence, mutual aid, continuity of care

## **Introduction**

Data from the 2007 National Survey of Mental Health and Wellbeing indicate that 22.1% of Australians meet lifetime criteria for alcohol use disorders (Teesson et al., 2010), with 7.5% meeting lifetime criteria for illicit drug use disorders (ABS, 2007). Importantly, an increasing international evidence base on the effectiveness of specialist Alcohol and Other Drug (AOD) treatment has emerged over the past three decades, including large multi-site outcome studies such as Project MATCH (Project MATCH Research Group, 1997) and COMBINE (Pettinati et al., 1996) in the US and NTORS (Gossop et al., 2000), DTORS (Donmall et al., 2009), DORIS (McKeganey et al., 2008) and UKATT (UKATT Research Team, 2005) in the UK. Nevertheless, our understanding of pathways through the treatment system, and the cumulative impact of engaging with specialist AOD and non-AOD community services on treatment outcomes remains limited.

To date, there have only been two multi-site treatment outcomes studies conducted in Australia, both focusing on people who use illicit drugs. The first, the Australian Treatment Outcomes Study (ATOS), was a longitudinal study commencing in 2001 examining 825 heroin users attending Opiate Substitution Treatment (OST), Residential Rehabilitation (RR) and Detoxification, and the study included 80 non-treatment needle-exchange consumers in New South Wales, South Australia and Victoria. Participant outcomes were assessed at 3, 12, 24 and 36 months and 11 years (Teesson et al., 2006; 2008; 2015). Key findings at 12-months were that 52% of detoxification, 63% of RR and 65% of OST clients reported past-month abstinence from heroin (14% continuous abstinence) with significant reductions in criminal behaviours, psychopathology, intravenous-related and physical health problems (Teesson et al., 2006).

The second major Australian study, 'Methamphetamine Treatment Evaluation Study (MATES)', commenced in 2006 and examined 360 meth/amphetamine users in community-based detoxification or

RR and 101 non-treatment quasi-controls. The study was conducted in Sydney and Brisbane with 3-, 12-, and 36-month follow-ups. Continuous abstinence from methamphetamine was reported by 33% at 3-months but fell to just 14% at the one-year follow-up and 6% at 3 years. Nevertheless, 60%, 42% and 41% no longer met criteria for dependence at 3 months and 1 and 3 years respectively (McKetin et al., 2012), and significant reductions in drug-related harms were also observed.

Both ATOS and MATES highlight the complexity and severity of individuals presenting for specialist AOD treatment (e.g. drug dependence, poor psychological health), as well as the substantial improvement observed across multiple clinical and psychosocial domains following treatment. Whilst desired outcomes from these two studies were associated with longer and more intensive treatment modalities (i.e. RR), cumulative time spent in multiple modalities (which could reflect periods of engagement, drop-out and re-engagement) was not. Research suggests outcomes are generally improved when there is continuity of care to address AOD problems across treatment types (e.g. ongoing support from counselling services following inpatient detoxification)(McLellan et al., 2000). There is increasing recognition that, like other chronic health problems (e.g. diabetes, asthma, schizophrenia, etc.), substance use disorders are best managed through continuing care models, involving ongoing monitoring and coordination between different services, rather than by an acute episodic treatment approach (Dennis and Scott, 2007; McKay et al., 2009; McLellan et al., 2000). Continuing care models have also been shown to be more cost-effective than acute treatment episodes (Popovici et al., 2008). The continuing care model in the US, which involves GP visits, on-going AOD specialist treatment and support from psychiatric services (where needed) has been associated with positive substance use outcomes up to nine years later (Chi et al., 2011; Chi and Weisner, 2008). Case management and active referral between AOD services are therefore likely to improve outcomes, but as identified in a recent

systematic review, few high-quality studies on continuity of care exist (Lenaerts et al., 2014). The benefits of continuing care with Australian treatment seekers and how these vary by a clients' primary drug of concern (PDOC) have not previously been examined.

Treatment outcome research (predominantly US and UK studies) has focussed primarily on responses to discrete isolated treatments or modalities (e.g. inpatient detoxification). These typically represent just one component of an individual's care, which may include multiple modalities of treatment within AOD services (e.g., detoxification, counselling, etc.), with specialist AOD services being one component of a broader system that can include health, social, and welfare services. Included in this broader system are informal sources of support that can contribute to the treatment journey such as mutual aid (e.g. 12-step programs such as Alcoholics Anonymous and Narcotics Anonymous, or SMART Recovery). Whilst there is evidence that mutual aid is associated with improved outcomes for clients with AOD issues (Kaskutas, 2009), its contribution to treatment success has received little attention in Australian treatment cohort studies. Consequently, the level of inter- and intra-sectorial integration, pathways of care, and their relationship to outcomes remain poorly understood, despite recognition of the merits in adopting a broader systems perspective when examining the benefits of treatment (Babor et al., 2008). Understanding the combinations of service use and pathways of care to address clients' multiple and disparate needs, and associated AOD outcomes, can inform the configuration of an effective treatment system.

Prior Australian treatment outcome research is limited to heroin and methamphetamine using cohorts. Problematic alcohol and cannabis users, however, represent 70% of all publicly funded treatment episodes in Australia (AIHW, 2014), and it is essential that future AOD treatment outcome research incorporates these populations. Furthermore, few studies consider outcomes across substance types or

in relation to poly-substance use which is common among treatment seekers (AIHW, 2014). The aim of the current study was to examine substance use outcomes among clients attending AOD services in Victoria and Western Australia (WA), and to examine factors associated with these outcomes, including the PDOC, type and nature of AOD service use, other forms of service use, and mutual aid engagement (i.e., the treatment pathway). The substance use outcomes of interest were: (1) treatment success - defined as a reliable reduction in the frequency of use/ abstinence from the PDOC, and (2) abstinence from all drugs of concern. Specific research questions were: (1) Do outcomes differ between clients with a primary alcohol versus primary drug problem? (2) Are outcomes improved with continuity in specialist AOD treatment (i.e. ongoing referral to other AOD services)? (3) Are outcomes improved with engagement with non-AOD community services and mutual aid? And finally, (4) to what extent do treatment pathways that achieve positive outcomes differ between clients with a primary drug and alcohol problem?

## **Method**

*Design and Procedure:* The study was a prospective, multi-site treatment outcome study. Participants were recruited via clinicians from 21 different AOD specialist services across 37 different sites in Victoria and Western Australia (WA) between January 2012 and January 2013. In total, 1054 clients were referred to the study for screening, of whom 796 (75.5%) met inclusion criteria, provided written informed consent, and completed the baseline interview (see Figure 1). Inclusion criteria were: aged 18



and above, commencing a new treatment episode (primary index treatment [PIT]) within the previous month, and not having engaged in the same type of treatment in the 3 weeks prior to commencing the current treatment episode. Further details on baseline characteristics of the cohort and methodology of recruitment can be found in Lubman et al. (2014). The outcomes for 73% (585/796) of the sample were ascertained: 555 (70%) participants were successfully re-interviewed over the telephone approximately 12-months later (11 were deceased and 19 were incarcerated; see Figure 1). Ethics approval was provided by Eastern Health Research and Ethics Committee; E17/1112, Monash University Human Research Ethics Committee (201200020) and Curtin University (HR11/2012).

*Sample:* The baseline sample (n=796) comprised 29 (4%) who had completed a comprehensive assessment, 146 (18%) receiving individual counselling, 24 (3%) receiving group counselling, 346 (43%) undergoing inpatient withdrawal, 6 (1%) undergoing home-based withdrawal treatment, 230 (29%) in long term residential treatment such as residential rehabilitation or therapeutic communities, and 15 (2%) commencing pharmacotherapy treatment. For the purpose of analyses, these treatment types were grouped into three PIT categories; 352 (44%) acute withdrawal (AW) (inpatient or home-based withdrawal), 214 (27%) outpatient services (OPS) (assessment, individual or group counselling, and pharmacotherapy), and 230 (29%) long-term residential (RR) (e.g. residential rehabilitation, and therapeutic communities).

*Measures:* Participants completed a comprehensive interview at baseline and again at follow-up, using standardised instruments validated on Australian populations where available. The interview captured

(i) demographic characteristics, (ii) pattern of substance use, including frequency of use of all licit and illicit substances in the past 30 days using the ASSIST (WHO ASSIST Working Group, 2002) as well as primary and secondary drugs of concern, (iii) problem severity using the Severity of Dependence Scale (SDS) (Gossop et al., 1995), (v) all service utilisation in the previous 12-months categorised using an adapted form of the Lifetime Drug Use History (LDUH) tool (Day et al., 2008), which examined: further specialist AOD (RR, OPS, AW); mutual aid (e.g. 12-step and SMART recovery); General Practitioner (GP) visits; acute health services (ambulance; hospital emergency departments (ED); hospital inpatient services); and other community health/social/welfare services (including mental health services, legal aid, financial counselling, employment services, family/relationship counselling, and housing). The tool was developed specifically to record number of visits and referral source for use of that service. Further (post-PIT) AOD service use was categorised as either 'continuity of care' (defined as further participation in post-PIT AOD treatment to which the participant was referred by the PIT or other AOD service, to reflect the process of active referral between AOD services that is considered a core component of the continuing care model) or 'fragmented care' (further AOD service attendance post-PIT, but without any referral from another AOD service). Treatment satisfaction was assessed using the CSQ-8 UK Client Satisfaction Questionnaire (Nguyen et al., 1983) a standardised measure of treatment satisfaction.

Following the National Institute on Drug Abuse consensus panel recommendations that either abstinence or reductions in frequency of use can represent clinically meaningful substance abuse treatment outcomes (Donovan et al., 2012), our primary outcome was achieving either a reliable reduction in the frequency (days) of PDOC use in the month prior to interview or abstinence from that PDOC. To address the issue of poly-substance use and the fact that the majority of the sample (61% for

alcohol and 76% for drugs) had abstinence as their treatment goal, the secondary outcome of interest was abstinence from all drugs of concern.

#### *Analyses:*

Distributions of continuous variables subject to between-group and/or repeated measures analyses (age, SDS score, CSQ-8 score) departed significantly from normality (Kolmogorov-Smirnov  $p < .001$ ). Comparisons of baseline age and SDS score between those who were and weren't followed up, and comparisons of CSQ-8 scores between those who did and did not complete their PIT, were therefore analysed with Mann-Whitney U tests. Between-group comparisons of categorical variables were conducted with Pearson  $\chi^2$  tests while changes in category sizes between baseline and follow-up were analysed with McNemar tests.

Reliable change criteria (RCC) for days of use of the PDOC were calculated using the Jacobson and Truax (1991) formula, in which the reliability of a measure and the standard deviation of the distribution of its scores at baseline is used to calculate the magnitude of change in an individual's score that would be less than 5% likely to occur by chance in the absence of real change in the underlying construct. We used the intra-class correlation (ICC) values reported for inter-rater reliability of the near-identical days of use measures from the Australian Treatment Outcomes Profile reported by Ryan et al. (2014) for each PDOC, generating RCC for reduced frequency of use (days).

Logistic regression models were used to examine predictors of outcomes. To determine demographic and social disadvantage indicators to be controlled for in the final model, we first analysed a model predicting the primary outcome with only demographic and social disadvantage variables (age, gender, state of residence, being married or in a de facto relationship, on unemployment benefits, recent

homelessness, and education) entered as predictors. Since age was the only statistically significant predictor, it was added to the final model which also included substance use and treatment process variables (PIT type, PIT completed, continuity in AOD treatment [i.e. having an additional episode of AOD service use, following or concurrent with the PIT, to which the participant was referred to by the PIT or another AOD service], PDOC, use of community services [other than GP] and mutual aid attendance), whilst controlling for the interval between baseline and follow-up as predictors of outcomes. Additional univariate logistic regression models were tested in participants who engaged in mutual aid during the follow-up interval to examine associations between number of meetings attended and treatment success. All analyses were conducted using SPSS 22.0.

## **Results**

### *Baseline Characteristics*

This paper describes the baseline characteristics and outcomes of the 555 participants successfully followed up (see Lubman et al. (2014) for a detailed description of the total cohort). At baseline, the most common PDOC was alcohol (49.4%), followed by cannabis (15.3%), meth/amphetamine (16.6%), opioids (15.9%) and other drugs (2.9%), and 51.7% of participants nominated at least one secondary drug of concern (SDOC). The sample was predominantly male, Australian-born and had a median age of 37.3 years (see Table 1 for a summary of demographics). Marginalisation and disability were common, with the majority not in paid employment, nor a stable relationship and with chronic medical conditions. The median drug dependence score on the SDS for their PDOC was 11, with 98.4% falling in the 'probable dependence' range (scoring >2) and 87.0% in the severely dependent range (scoring >6). As shown in Table 1, those with alcohol as their PDOC were older, more likely to be foreign-born and have an educational qualification, but were less likely to be male, to have secondary Drugs of concern (DOCs),

to be receiving welfare benefits, to have experienced recent homelessness, and to be experiencing legal problems than those with other PDOCs. The mean time between baseline and follow-up interviews was 380.3 ( $\pm 71.8$ ) days. Participants lost to follow-up were significantly younger ( $p < .001$ ), more likely to have experienced recent (past 90 days) homelessness prior to intake ( $p < .01$ ), be involved in the criminal justice system ( $p < .001$ ) and have meth/amphetamine as the PDOC ( $p < .01$ ), and were less likely to have been suffering a chronic medical condition ( $p < .05$ ), relative to those successfully re-interviewed.

#### *Service Use*

As a consequence of their severity and complexity, participants were engaged with a diverse range of services at baseline and most (68.8%) had received specialist AOD treatment in the year prior to the PIT. Table 2 shows changes in engagement with health (including acute services), social and welfare services in the year pre- and post-PIT. Approximately three-quarters engaged in further AOD specialist treatment post-PIT and reported using a non-AOD community service, with a significant 15.7% reduction ( $p < .001$ ) in the proportion reporting use of acute services relative to baseline rates.

#### *Completion, duration and satisfaction with the primary index treatment.*

Almost two-thirds (65.6%) reported completing their PIT, with an additional 33 (6.0%) remaining in the PIT for the study duration. The median duration for those who had completed their PIT was 70 days for OPS, 7 days for AW, and 70 for RR. Treatment satisfaction (a positive response to “Did you feel you successfully achieved what you wanted from treatment?”) was indicated by 77.3% of AW, 69.8% of RR and 62.3% of OPS participants. A Mann-Whitney U test revealed significantly higher scores on the CSQ-8 treatment satisfaction scale among participants who completed their PIT relative to those who left prematurely (median of 30 vs. 26 out of a possible 32;  $p < .001$ ).

#### *Primary outcome (treatment success)*

Of those retained in the study, just over half (52.0%) of the cohort had reliably reduced the frequency of their PDOC (days in the month prior to interview) or had ceased using it (i.e. were abstinent in the previous month), and these participants were considered to be a 'treatment success'. Rate of treatment success was highest when meth/amphetamine was the PDOC, followed by opioids, then cannabis, and was lowest for alcohol and 'other drugs' (see Figure 2 for rates of treatment success by PDOC). Taking a conservative approach and assuming those lost to follow-up had continued using, 35.9% of the entire baseline sample would be classed as treatment successes. The overall rate of abstinence<sup>1</sup> from the PDOC in the month prior to follow-up was 37.5% and highest when the PDOC was meth/amphetamine followed by opioids, 'other drugs', cannabis, and was considerably lower for alcohol (see Figure 2). Finally, 13.9% reported being continuously abstinent from their PDOC during the entire year between baseline and follow-up interview (26.1% when the PDOC was meth/amphetamine, 17.0% for opioids, 16.5% for cannabis, and 7.7% for alcohol;  $p < .001$ ).

#### *Abstinence from all DOCs*

Past-month abstinence from all drugs of concern (other than tobacco) was reported by 30.5% of the follow-up sample. Taking a conservative approach and assuming those lost to follow-up would not have been abstinent at follow-up, 21.3% of the entire baseline sample was abstinent from all DOCs. Only 4.3% reported being continuously abstinent from all alcohol and drug use (aside from tobacco) during the past year.

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<sup>1</sup> Participants prescribed their PDOC, or a pharmacologically similar substance (e.g. substitution pharmacotherapy) and using it as prescribed (i.e. never used more than the prescribed dose or sourced additional illicit supplies of the substance or pharmacologically similar substances) were considered abstinent from their PDOC for the purpose of these analyses

#### *Impact of specialist AOD pathway and community service use on outcomes*

Chi-square analyses indicated that, if participants who accessed further AOD services following baseline experienced continuity of AOD specialist services (n=200), they reported significantly higher rates of PDOC abstinence (38.2% versus 25.2%,  $p < .01$ ) and treatment success (61.0% versus 44.0%,  $p < .001$ ) than those who received fragmented AOD specialist treatment (n=206). There were no significant differences in outcomes associated with use of community services in the past 12 months in the whole sample (all  $p > .05$ ).

#### *Predictors of treatment success (PDOC)*

The preliminary model that only included demographic and social disadvantage indicators (gender, Australian state, education, not being married or in a de facto relationship, unemployment, and recent homelessness) had a small but statistically significant predictive value for treatment success (Nagelkerke  $R^2 = .04$ ,  $\chi^2 = 18.17$ ,  $p = .03$ ), with age as the only significant individual predictor ( $OR = 0.98$ ,  $p < .05$ ), with younger participants more likely to achieve treatment success. Age was therefore entered as a predictor in subsequent regression analyses alongside treatment characteristics (e.g. PIT completion, PIT-type, continuity of specialist AOD care, community service use), PDOC, and mutual aid attendance, controlling for follow-up interval.

In the first logistic regression analysis examining predictors of treatment success (see Table 3, column 1), the overall model was significant (Nagelkerke  $R^2 = .12$ ,  $\chi^2 = 49.4$ ,  $df = 12$ ,  $p < .001$ ). Relative to clients with alcohol as their PDOC, those with meth/amphetamine as the PDOC had more than twice the odds ( $OR = 2.2$ ,  $p < .01$ ) of being a treatment success. Completing the PIT almost doubled the odds ( $OR = 1.91$ ,  $p < .01$ ), whilst attending mutual aid increased the odds of being a treatment success by 72.0%.

To explore possible differences between clients with primary alcohol problems and those with primary drug problems, this regression analysis was repeated separately for the two groups (see Table 3, columns 2 and 3). For clients with a primary alcohol problem, the model was significant (Nagelkerke  $R^2=.12$ ,  $\chi^2=25.1$ (df=8),  $p<.01$ ), but the only significant predictors were mutual aid attendance (OR=2.5,  $p<.01$ ) and engaging in community services (OR=2.0,  $p<.05$ ), which doubled (or more) the odds of treatment success. For clients with a primary drug problem, the model was also significant (Nagelkerke  $R^2=.16$ ,  $\chi^2=34.5$  (df=11),  $p<.001$ ), but only PIT completion (OR=2.8,  $p<.01$ ), and continuity in specialist AOD service use increased the likelihood of being a treatment success (OR=1.8,  $p<.05$ ).

#### *Predictors of abstinence from all DOCs*

Applying the above model to specifically predict abstinence from all DOCs (see Table 3, column 4), we found that the overall model was significant (Nagelkerke  $R^2=.12$ ,  $\chi^2=47.20$ , (df=12),  $p<.001$ ). Relative to participants with alcohol as their PDOC, those with meth/amphetamine had nearly twice the odds of abstaining from all DOCs. Completing the PIT also almost doubled the odds, as did attending mutual aid. Having AW as the PIT relative to RR, significantly reduced the odds of achieving abstinence from all DOCs, though continuity in AOD specialist care and community service use (excluding GPs) had no impact on this outcome. When analyses were restricted to participants with alcohol as their PDOC, mutual aid attendance became a stronger predictor (OR=2.3) and RR as the PIT was superior to both AW and OPS as a predictor. In contrast, when restricted to clients with drugs as a PDOC, mutual aid attendance and RR as the PIT were both lost as predictors, whilst PIT completion became slightly stronger.

#### *Association between mutual aid and outcomes*



Since mutual aid attendance predicted treatment success in clients with a primary alcohol (but not drug) problem, this effect was explored further by examining the impact of frequency of meeting attendance among those with any mutual aid attendance. The most common forms of mutual aid among those who had attended at least one meeting in the past year ( $n=267$ ) were Alcoholics Anonymous (68%) and Narcotics Anonymous (67%), whilst 11% attended SMART recovery meetings and 5% reported attendance at 'other' recovery groups. Bivariate logistic regression analysis, with number of mutual aid meetings attended during the follow-up period as the predictor, showed that each mutual aid meeting attended increased the odds of treatment success by approximately 1% ( $OR=1.01$ ,  $p<.01$ ). When the analysis was restricted to those with alcohol as their PDOC, this effect remained significant ( $OR=1.01$ ,  $p<.05$ ), but when restricted to those with other drugs as their PDOC, this was non-significant ( $OR=1.00$ ,  $p=.07$ ). Figure 3 shows that success rates for clients with a primary alcohol problem were substantially lower when there was little or no engagement in mutual aid, but increased to levels similar to those shown by clients with drugs as their PDOC with higher frequency of mutual aid engagement.

## **Discussion**

This multi-site study examined treatment outcomes for clients with a broad range of PDOCs (including alcohol and cannabis), who were accessing AOD treatment across multiple service types. The study is unique in examining client engagement within the broader treatment and welfare systems, both in the year prior to and following study intake, and the relationship with treatment outcomes. Supporting earlier treatment outcome research, marked improvements in AOD use were observed at the 12-month follow-up with more than half of the sample substantially reducing the number of days they used their PDOC, and more than one-third reporting abstinence from their PDOC in the month prior to interview.

Another strength of the study is its consideration of abstinence from all drugs of concern, an outcome achieved by over 30% of the retained sample. Substance use outcomes did not vary greatly by PDOC, but were best when meth/amphetamine was the PDOC and poorest with alcohol.

After controlling for the effect of multiple independent variables, completing the PIT predicted a higher likelihood of both outcomes, consistent with international literature that emphasises the importance of treatment retention and completion (Gossop et al., 2001; Simpson and Sells, 1990). Having a residential rehabilitation as the PIT predicted abstinence for the whole sample, but did not significantly predict treatment success when the alcohol was the PDOC. Mutual aid attendance significantly predicted both outcomes, as did having a primary meth/amphetamine problem relative to alcohol.

Mutual aid attendance and community service engagement were significant predictors for clients with a primary alcohol problem, whilst PIT completion and continuity of specialist AOD care were significant predictors for those with a primary drug problem, with no predictor being significant in both groups. These findings support US data on the value of continuity in specialist AOD treatment and engagement with non-AOD community health and welfare services (Chi et al., 2011; Chi and Weisner, 2008), however they suggest that specific components of this model may differentially benefit distinct substance-using populations. It is possible that characteristics associated with alcohol-dependent individuals presenting to treatment, such as older age, longer problem use histories and greater cognitive impairment (Stavro et al., 2013), as well as societal factors (e.g. the pervasive availability of alcohol and its greater social acceptability in comparison to illicit drugs) pose particular challenges for those with alcohol as their PDOC, despite lower level of social disadvantage identified in the current sample. This may explain why engagement with community services and mutual aid significantly increased the likelihood of successfully responding to treatment, since they could offer the necessary support mechanisms to

safeguard against the ubiquitous opportunities to consume alcohol in Australian society. Interestingly, engagement with community services and mutual aid failed to boost outcomes for clients with a primary drug problem who instead benefited from a more extensive or continuous AOD treatment pathway (completing the PIT and being referred onto further AOD treatment). This may reflect differences in perceived suitability to, or need for, specialist AOD treatment between clients with a primary alcohol or drug problem. Thus, failing to complete a treatment episode or the absence of continued AOD specialist care becomes more of a setback for clients with a primary drug problem who have fewer support options outside of specialist AOD services.

Since most long-term residential therapeutic care is abstinence-oriented, it was not surprising that having RR as the PIT was a significant predictor of abstinence from all DOCs, although this was limited to clients with a primary alcohol problem. This highlights the need to increase the availability and accessibility of RR, and is consistent with a growing international literature on the effectiveness of long-term residential care for achieving abstinence (e.g. Vanderplasschen et al., 2014). It is recognised that a period of residential stay can be a sufficient 'turning point' in a developmental recovery trajectory (Best, 2014). However, in light of its elevated cost and limited places, alternative, cost-effective models of care and integration within the community must also be identified. Whilst again limited to clients with a primary alcohol problem, a dose-response effect of mutual aid engagement was observed whereby attendance at more meetings increased rates of treatment success. This is consistent with earlier research (Kaskutas, 2009) and supports an additive effect of treatment and mutual aid. These findings suggest alcohol-dependent clients require engagement with support beyond professional AOD treatment to enhance their treatment journeys and recovery pathways. The findings support the benefits of mutual aid engagement as a form of aftercare or as an adjunctive therapy (Kelly et al., 2013).

It is important to recognise however, that mutual aid attendance could simply reflect a greater motivation to overcome AOD problems rather than having a direct casual impact on outcomes.

There are a number of important limitations that must be considered when interpreting these results. While AOD treatment was found to be effective, it is important to note the absence of a no-treatment control group. Natural recovery is well documented (Dawson et al., 2005), and may have led to some of the improvement. Moreover, patients are more likely to present for treatment at times of crisis, and substance use and other problems may naturally improve over time. Nevertheless, the finding that treatment type, treatment completion, and referral pathways leading to continuity of AOD treatment influenced outcomes suggests that at least some treatment types and pathways have additional beneficial effects above any effects that would be expected in the absence of treatment. This is consistent with findings from MATES and ATOS, which both demonstrated superior outcomes among treated relative to non-treated drug-dependent individuals. Moreover, other factors associated with positive outcomes in the current study, such as engagement with wraparound community services and other forms of support (e.g. mutual aid), were significant after controlling for treatment intensity and duration, highlighting the important role of both specialist AOD and non-AOD support systems.

Since participants were not randomly assigned to different levels of predictors (e.g. randomised to PIT types or mutual aid), causal conclusions cannot be drawn definitively, as unmeasured confounding factors may explain some of the associations between predictors and outcomes. Whilst the follow-up rate of 70% is acceptable, the outcomes of those who could not be re-contacted for interview, which could reflect greater instability and poorer functioning, are likely to be poorer and differences in the characteristics of those who were and weren't followed up may have biased findings. A further limitation was that telephone interviews precluded the use of objective measures (breathalyser or urine

analysis) to corroborate self-reported AOD use. Self-report is however, well-established as an accurate method for capturing AOD use under conditions that were applied in the current study (i.e. when confidentiality is guaranteed and when reporting to an independent researcher (Napper et al., 2010)).

Despite the aforementioned study limitations, the findings point towards a number of important implications for policy and practice. Given the increasing public concern around individual and community harms associated with meth/amphetamine use (ACC, 2015), the high rates of abstinence and reduced days of use among participants with a primary meth/amphetamine problem is encouraging, and highlights the importance of broadly promoting the effectiveness of AOD treatment to the community. Since completion of the PIT was a robust predictor of outcome among clients with a primary drug problem, it reinforces the importance of strategies to enhance treatment retention and satisfaction during treatment (Simpson, 2004).

Since greater continuity in AOD specialist treatment was also important, this calls for enhanced efforts around case co-ordination, regular reviews of client need and assertive and timely referral to appropriate services to aid transition through the AOD treatment system. In addition, as fragmented AOD treatment pathways were associated with poorer outcomes, methods to enhance retention and completion should be investigated. Indeed, our findings highlight the importance of funding models that promote continuity and service integration and facilitate treatment journeys that involve multiple treatment modalities and greater linkage to follow-up care.

Service providers might consider assertive linkage to supportive community groups, including but not restricted to mutual aid groups. These can offer a free and widely available form of aftercare which are important for chronic and relapsing conditions (O'Brien and McLellan, 1996). Referral from specialist AOD settings to community-based recovery-focussed organisations has proven effective in international

research (Kaskutas, 2009; Manning et al., 2012; Timko et al., 2006), and is considered an important component of an integrated treatment system (White, 2009).

The present study highlights the importance of treatment systems research that looks at treatment populations as they occur and considers the effectiveness of the AOD service sector within broader health and welfare systems. The study examines treatment outcomes as they occur within existing treatment services/systems including clients selected only by their willingness to participate and not by the rigorous clinical inclusion/exclusion criteria of RCTs. Such naturalistic treatment outcome studies are needed to complement the already well-established tradition of controlled studies of particular treatment modalities, which by design provide limited information on the influence of context (e.g., setting, funding, workforce) and implementation challenges. Further investment in treatment systems research is essential for informing the design of the Australian AOD sector, and identifying the strengths and weaknesses of particular models of care.

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The authors report no conflicts of interest and are responsible for the content and writing of the paper.

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