



What Client Demographic, Substance Use, Mental Health, Treatment, and Psychological Variables Predict Residential Treatment Completion for Substance Use Disorders?

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Abstract

Residential treatment is a common option for individuals with moderate to severe substance use disorders. In a cohort of individuals who accessed residential treatment, we investigated client demographic, substance use, mental health, treatment, and psychological predictors of treatment completion. Participants were a retrospective cohort of 1056 (15–69 years) individuals admitted to residential treatment facilities across Queensland, Australia, from January 2014 to December 2016. Participant characteristic information was obtained at admission, including the Depression Anxiety Stress Scale 21 (DASS-21). A multiple logistic regression model was conducted with treatment completion as the outcome. The overall rate of treatment completion was 14.3%. Mild to moderate (aOR = 0.48 [0.28–0.84], $p = .010$) and severe to extremely severe (aOR = 0.35 [0.17–0.74], $p = .006$) stress on the DASS-21 at service entry was significantly associated with a lower likelihood of treatment completion. Participants with higher levels of stress at service entry were less likely to complete treatment, representing a missed opportunity to provide targeted support during high-risk periods for individuals with substance use disorders. Further research investigating the nature and causes of stress in-between, during, and following presentations to residential treatment is needed.

Keywords Substance use disorder · Residential treatment · Substance use treatment · Mental health · Treatment completion

Substance use disorders (SUDs) are a prevalent issue globally and in Australia, with 5.1% of the Australian population aged 16 to 85 years experiencing a SUD within 12 months (Australian Bureau of Statistics, 2008). While treatment options for SUDs are varied, the consistent goals of treatment are symptom reduction, management of substance use, and improvement in health and functionality (SAMHSA, 2016). A common option

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for individuals with a moderate to severe SUD is treatment within a structured residential facility (Cutcliffe et al., 2016; Reif et al., 2014). These residential treatment facilities remove individuals from risk factors of substance use, with time spent in residential treatment predicting lower levels of substance use and offending behaviour, and improvement in mental health and social outcomes such as employment and relationships (de Andrade et al., 2019). Residential substance use treatment has also been associated with higher rates of abstinence (McKetin et al., 2019), reductions in overdose and substance use frequency (Pasareanu et al., 2016), and reduced risk of relapse (Andersson et al., 2019). Despite these positive outcomes, several factors influence the course and outcome of residential treatment.

A review of residential substance use treatment reported low completion rates (9–56%), due to high rates of early discharge prior to treatment completion (Malivert et al., 2012). Early discharge from residential treatment has been associated with poorer outcomes including mortality, relapse, and readmission (Decker et al., 2017). Numerous factors have been associated with an increased risk of early discharge, including psychiatric comorbidities, polysubstance use, younger age, and previous early discharges from treatment (Palmer et al., 2009; Sofer et al., 2018; Sofin et al., 2017). On the other hand, initial motivation when entering substance use treatment has been associated with treatment engagement (Joe et al., 1998; Rapp, et al., 2007; Sloas et al., 2018).

Factors such as treatment readiness, problem recognition, and desire to seek help predict greater success in treatment through increased treatment engagement (Becan et al., 2015; DiClemente and Donovan, 2010). Treatment engagement is often a focus of treatment to increase treatment retention and reduce risk of early discharge (Harris et al., 2010). The time an individual is in treatment represents an important period of protection from risk factors, and early discharge reduces the time an individual has access to resources and support targeting their substance use.

Research focused on time in residential treatment and substance use has largely concluded that greater time leads to better treatment outcomes (Drake et al., 2011; Meier & Best, 2009). While both long-term (> 6 months) and short-term (2–4 months) residential treatment programmes are effective in improving substance use outcomes, little research has examined the impact of programme length on treatment completion. In a study investigating self-help groups in short-term residential treatment for SUDs, increased treatment completion was associated with attendance of self-help groups, while the risk of early discharge was reduced (Mohamed et al., 2022). The significant impacts that self-help groups have on retention and treatment completion demonstrate the lasting impacts that can occur within a relatively brief time in short-term residential treatment.

Andersson et al. (2019) conducted a prospective multicentre cohort study investigating the roles of mental distress and relapse following inpatient treatment for substance use. Individuals with co-occurring psychiatric disorders and younger age were more likely to relapse following treatment. While individuals attending short-term treatment (2–4 months) were at a greater risk relapse than those attending long-term treatment (6–12 months), the characteristics of the centres such as level of involvement, staff to client relationships, and atmosphere were associated with increased risk of relapse rather than time in treatment. Within therapeutic communities for SUDs, client perceptions such as the orderliness and level of engagement within their treatment predict treatment completion (Carr & Ball, 2014). Residential treatment centres differ due to differences in clients, staff, management structure, and service delivery within each unique site and play an important role in treatment outcomes and should take a focus within treatment settings (Meier & Best, 2009).

A strong association between mental health and SUDs has been demonstrated in numerous epidemiological studies (Compton et al., 2007; Schuckit, 2006; Swensden et al., 2010). Comorbid mood and anxiety disorders specifically co-occur at the highest rate among individuals with SUDs (Conway et al., 2006; Grant et al., 2004; Prior et al., 2017; Torrens et al., 2011). Psychiatric comorbidities have a negative impact on the treatment course, outcomes, and relapse of substance use problems, including early discharge from residential treatment (Boschloo et al., 2012; Bruce et al., 2005; Burns et al., 2005).

Stress is a known risk factor in the development and perpetuation of SUDs and has been shown to increase drug craving and risk of relapse in individuals with SUDs (Sinha, 2001, 2008). Clinical trials investigating stress responses within substance using populations have demonstrated stress-induced cravings increase vulnerability to drug-seeking behaviour and relapse (Fox et al., 2005, 2007). With a high amount of psychiatric comorbidity among individuals with SUDs, it is important to highlight the impact psychiatric comorbidity has on the course and outcome of residential treatment.

A study investigating predictors of treatment completion in an Australian therapeutic community residential substance use treatment service found lower odds of programme completion among clients with higher levels of relationship satisfaction, amphetamine use (as primary drug of concern), aggression problems, and at the extreme ends of age spectrum (youngest and oldest) (Harley et al., 2018). Mental health symptoms improved over time from admission to discharge of treatment, but the severity of depression, anxiety, and stress at admission did not predict treatment completion. While there is a high amount of psychiatric comorbidity among individuals with SUDs, the presence of these problems at the onset of treatment was not seen to impact treatment completion within Harley et al.'s (2018) study.

Finally, drug-abstaining self-efficacy or an individual's belief that they can cope with and resist urges to use substances in high-risk situations has been shown to predict substance use treatment outcomes for alcohol (Alexander et al., 2020), methamphetamine (Mutumba et al., 2021), nicotine (Gwaltney et al., 2009), and cannabis (Litt & Kadden, 2015; Litt et al., 2013). In studies of individuals with SUDs in residential treatment settings, a high level of drug-abstaining self-efficacy has been found to be a strong predictor of 1-year abstinence following treatment (Ilgen et al., 2005) and to predict abstinence and drinking frequency up to 5 years post-treatment (Muller et al., 2019).

The Current Study

The current study aims to extend existing literature by identifying which client demographic, substance use, mental health, and treatment variables predict residential treatment completion for SUDs. Identifying which variables are stronger predictors of residential treatment completion will increase understanding of what variables to target during and following residential treatment to improve client outcomes.

Materials and Methods

Participants

This retrospective cohort study was conducted with 1056 unique individuals who accessed residential substance use treatment at least once between January 2014 and

December 2016 at three centres in Queensland, Australia. At the time of data collection, these centres utilised a therapeutic community model of residential treatment. Three in-patient residential sites were included in the current study: site 1 was a treatment centre for adults (18+ years), site 2 was for young people aged 18 to 35 years (standard youth programme), and site 3 provided services exclusively for Indigenous Australians. To be eligible for admission, individuals had to be detoxified from substances. This study was approved by The University of Queensland Human Research Ethics Committee (approval number: 2018001063).

Measures

Client demographic, substance use, mental health, and treatment information collected by staff, as well as two self-report measures completed by clients at admission to the residential treatment programme, were utilised for this project. Deidentified residential treatment episode data was extracted by a reporting analyst from the services.

Demographic and Characteristic Variables

Demographic characteristics included age; sex (female, male; people who were transgender were recoded as the sex they identified with); legal status (justice involved at admission yes/no); and Indigenous Australian status (yes/no; included Aboriginal and/or Torres Strait Islander origin).

Treatment Variables

Treatment data included the name of the residential facility the client had been admitted (site 1, adult; site 2, young adults, site 3, Indigenous Australian adults) and the number of previous admissions to a LLW residential facility (no previous admissions, 1 or more previous admissions).

Substance Use

The primary substance of concern identified by clients at admission from a list of 22 substances was recoded into four categories, including alcohol, cannabis, and methamphetamine or 'other' drugs. Lifetime injecting drug use status was a binary variable (no/yes). Polysubstance use was recorded for individuals with three or more substances of concern (no/yes).

Mental Health

Scores on the 21-item Depression, Anxiety and Stress Scale (*DASS-21*) (Lovibond & Lovibond, 1995) were used to measure the severity of mental health concerns in the week prior to admission and at discharge. The *DASS-21* provides a measure of the frequency of depression, anxiety, and stress, rated on a 4-point Likert scale that ranges from 0 'did not apply to me at all' to 3 'applied to me very much or most of the time'. The resulting total score for each of the three subscales was categorised into normal (depression 0–9, anxiety 0–7, stress 0–14), mild or moderate (depression 10–20, anxiety

8–14, stress 15–25), and severe or extremely severe (depression 21+, anxiety 15+, stress 19+) levels of depression, anxiety, and stress. The construct validity of severity cut-offs initially proposed by Lovibond and Lovibond (1995) has been demonstrated within clinical, non-clinical, and substance using populations (Antony et al., 1998; Beaufort et al., 2017; Lee, 2019) and has excellent reliability, concurrent, convergent, internal, and discriminative validity (Coker et al., 2018).

Self-efficacy

The Drug-Taking Confidence Questionnaire 8-item version (DTCQ-8) was used to measure drug refusal self-efficacy at the time of admission and discharge. The *DTCQ-8* provides a brief assessment of projected drug refusal self-efficacy over eight items of high-risk scenarios for substance use (Sklar & Turner, 1999). Clients report their degree (percentage) of confidence in their ability to resist the urge to drink heavily, or to engage in the use of another drug, on a 6-point scale ranging from 0% (not at all confident) to 100% (very confident). Scores below 80 are categorised as low refusal self-efficacy with scores 80 and above being categorised as high refusal self-efficacy. The reliability and validity of the DTCQ-8 have been confirmed within substance using populations (Vasconcelos et al., 2016).

Dependent Variable — Treatment Completion and Discharge

A successful treatment completion was recorded by staff if a participant spent a minimum of 4 weeks within a residential substance use facility and demonstrated progress towards treatment goals with a planned exit or transition out of treatment. Treatment not completed or early discharge (commonly known as irregular discharge) included patients who were discharged against medical advice and those who were asked to leave. If a participant discharged from the facility prematurely, the reason for the early departure was recorded (see Table 1). Reasons recoded as ‘Other’ for treatment non-completion included imprisonment, leaving to study, community demands, and attending drug court.

Statistical Analysis

All participants were included in all analyses. Missing data was low for most variables of interest (<3%), except for DTCQ-8 at admission (24%) and discharge (60%) and the DASS-21 at admission (20%) and discharge (50%). Due to the high proportion of individuals with missing scores on the DTCQ-8 and DASS-21 at discharge, these scores were excluded from analyses. A higher proportion of individuals with missing data on these measures did not complete treatment, had no previous treatment episodes, were over the age of 25, and primarily used alcohol as a drug of concern (see Appendix 1 Table 4). Multiple imputation was used to impute missing data (Jakobsen et al., 2017). The multiple imputed and original data were similar overall; however, the imputed data demonstrated a higher proportion of individuals who had never injected substances in their lifetime compared with original data (see Appendix 2 Table 5).

Univariate logistic regressions were conducted, entering each predictor separately with treatment completion as the dependant variable. Predictors that were individually entered included age, sex, treatment site, Indigenous Australian status, primary drug of concern, lifetime injecting drug use, legal status, any previous admissions, polysubstance use, and scores on the depression, anxiety, and stress scales of the DASS-21 and the DTCQ-8 at

Table 1 Treatment completions recategorised into ‘treatment completion’ and ‘treatment not completed’ by category ($n = 1056$)

| Treatment completion | Discharge reason | <i>n</i> | % |
|-------------------------|--|----------|-------|
| Treatment completed | | 151 | 14.0% |
| Treatment not completed | | 905 | 86.0% |
| | Ceased to participate against advice | 359 | 34.0% |
| | Behaviour unacceptable (e.g. aggression) | 135 | 12.8% |
| | Ceased to participate involuntary (non-compliance) | 126 | 12.2% |
| | Other | 85 | 8.2% |
| | Ceased to participate without notice | 57 | 5.4% |
| | Ceased to participate by mutual agreement | 55 | 5.2% |
| | Returned to substance abuse | 37 | 3.5% |
| | Inability to follow house rules | 23 | 2.2% |
| | Transferred to another service provider | 28 | 2.7% |
| Total | | 1056 | 100 |

admission to treatment. Adjusted multiple logistic regression analyses were then conducted accounting for all previously mentioned predictors entered at once, with treatment completion as the dependent variable.

Results

Participant Characteristics

The cohort of individuals who accessed residential substance use treatment was aged 18–69 ($M = 32.04$, $SD = 9.55$) and primarily male ($n = 696$; 65.8%). Of individuals identifying as Indigenous Australians ($n = 299$; 28.3%), 66.0% attended the exclusive Indigenous Australian treatment site ($n = 198$). The overall average time in treatment was 59.54 days ($SD = 67.24$) varying by site, with site 1 having the highest average time in treatment ($M = 73.87$ days, $SD = 70.83$), followed by site 2 ($M = 58.52$, $SD = 73.60$) and site 3 ($M = 50.01$, $SD = 60.10$). Most individuals had no previous admissions to treatment in a residential centre ($n = 662$; 62.7%; see Table 2).

The most frequent primary substances of concern were alcohol ($n = 402$; 38.1%), methamphetamines ($n = 358$; 33.9%), and cannabis ($n = 144$; 13.6%). There was a substantial proportion of individuals who scored extremely severe on the DASS-21 for depression ($n = 180$; 17.0%), anxiety ($n = 224$; 21.2%), and stress ($n = 89$; 8.4%). Most participants scored low abstinence self-efficacy on the DTCQ at admission ($n = 654$; 81.9%). Time in treatment was positively correlated with treatment completion ($r = 0.43$, $p < 0.001$), with completers ($M = 146.91$, $SD = 83.43$) spending more days in treatment on average than non-completers ($M = 44.96$, $SD = 51.31$).

Table 2 Participant demographic, substance use, mental health, and treatment characteristics (*n* = 1056)

| | Total | | Completion status of total | |
|------------------------------|--------------|-------|----------------------------|----------------|
| | <i>n</i> | Col % | <i>n</i> complete | Completion (%) |
| Treatment completion | | | | |
| Completion | 151 | 14.3% | - | - |
| Non-completion | 905 | 85.7% | - | - |
| Age at admission | | | | |
| Mean (SD) | 32.04 (9.55) | | | |
| 18–24 | 245 | 23.2% | 28 | 11.4% |
| 25 + | 811 | 76.8% | 123 | 15.2% |
| Sex | | | | |
| Female | 360 | 34.1% | 45 | 12.5% |
| Male | 696 | 65.8% | 106 | 15.2% |
| Site | | | | |
| Site 1 | 351 | 33.2% | 68 | 19.4% |
| Site 2 | 507 | 48.0% | 62 | 12.2% |
| Site 3 | 198 | 18.8% | 21 | 10.6% |
| Indigenous Australian status | | | | |
| Non-Indigenous Australian | 757 | 71.7% | 117 | 15.5% |
| Indigenous Australian | 299 | 28.3% | 34 | 11.4% |
| Principal drug | | | | |
| Cannabis | 144 | 13.6% | 21 | 14.6% |
| Alcohol | 402 | 38.1% | 68 | 16.9% |
| Methamphetamine | 358 | 33.9% | 38 | 10.6% |
| Other | 152 | 14.4% | 24 | 15.8% |
| Injecting drug use | | | | |
| Never injected | 841 | 79.9% | 128 | 15.2% |
| Injected in lifetime | 212 | 20.1% | 23 | 10.8% |

Table 2 (continued)

| | Total | | Completion status of total | |
|--------------------------------|----------|-------|----------------------------|----------------|
| | <i>n</i> | Col % | <i>n</i> complete | Completion (%) |
| Legal status | | | | |
| None | 673 | 64.5% | 103 | 15.3% |
| Justice involved | 371 | 35.5% | 46 | 12.4% |
| Previous admissions | | | | |
| 0 | 662 | 62.7% | 104 | 15.7% |
| 1 + | 394 | 37.3% | 47 | 11.9% |
| Polysubstance use | | | | |
| No | 957 | 90.6% | 134 | 14.0% |
| 3 + drugs of concern | 99 | 9.4% | 17 | 17.0% |
| Admission DASS | | | | |
| Depression | | | | |
| Normal | 256 | 30.4% | 47 | 18.4% |
| Mild and/or moderate | 284 | 33.7% | 37 | 13.0% |
| Severe and/or extremely severe | 303 | 36.0% | 49 | 16.2% |
| Anxiety | | | | |
| Normal | 251 | 29.8% | 47 | 18.7% |
| Mild and/or moderate | 267 | 31.6% | 44 | 16.5% |
| Severe and/or extremely severe | 325 | 38.6% | 42 | 12.9% |
| Stress | | | | |
| Normal | 344 | 40.8% | 72 | 20.9% |
| Mild and/or moderate | 258 | 30.6% | 32 | 12.4% |
| Severe and/or extremely severe | 241 | 28.6% | 29 | 12.0% |

Table 2 (continued)

| | Total | | Completion status of total | |
|-------------------------------|----------|-------|----------------------------|----------------------------------|
| | <i>n</i> | Col % | <i>n</i> complete | Completion (%) % of completed |
| Admission DTCQ | | | | |
| Low abstinence self-efficacy | 654 | 81.9% | 97 | 14.8% 75.2% |
| High abstinence self-efficacy | 145 | 18.1% | 32 | 22.1% 24.8% |

Score cut-offs for the DASS-21: depression 0–9 normal, 10–20 mild and/or moderate, 21–28 + extreme and/or extremely severe; anxiety 0–7 normal, 8–14 mild and/or moderate, 15–20 + severe and/or extremely severe; stress 0–14 normal, 15–25 mild and/or moderate, 26–34 + severe and/or extremely severe. Score cut-offs for the DTCQ8: 0–79 low abstinence self-efficacy, 80 + high abstinence self-efficacy

Treatment Completion

The overall rate of treatment completion was 14.3% ($n=151$). A slightly higher proportion of completions was observed in non-Indigenous Australians ($n=117$, 15.5%) compared to Indigenous Australians ($n=34$, 11.4%), with the Indigenous Australian exclusive site 3 having the second lowest site completion rate ($n=21$, 10.6%). Treatment completion was observed to be lowest for individuals who primarily used methamphetamine ($n=38$, 10.6%), had injected drugs ($n=23$, 10.8%), were involved in the justice system at admission ($n=46$, 12.4%), and were aged under 25 ($n=28$, 11.4%).

Predictors of Treatment Completion

When looking at individual predictors of treatment completion, identifying as Indigenous Australian (OR=0.62 [0.40–0.96], $p=0.032$), attending site 2 (OR=0.58 [0.40–0.84], $p=0.004$) or site 3 (OR=0.49 [0.29–0.83], $p=0.008$), and lifetime injecting drug use (OR=0.66 [0.44–0.98], $p=0.039$) significantly predicted a lower likelihood of treatment completion. Psychological variables at admission also predicted treatment completion with mild and/or moderate (OR=0.57 [0.36–0.90], $p=0.015$) and severe and/or extremely severe (OR=0.53 [0.33–0.85], $p=0.015$) stress on the DASS-21, and low drug abstaining self-efficacy (OR=0.62 [0.39–0.96], $p=0.008$) on the DTCQ-8 significantly predicting a lower likelihood of treatment completion.

After accounting for all predictors, Indigenous Australian status, treatment site attended, lifetime injecting drug use, and low drug abstaining self-efficacy at service entry were no longer significantly related to treatment completion; however, stress scores on the DASS-21 at admission were significant. When compared to individuals with normal levels of stress, individuals with mild and/or moderate (aOR=0.48 [0.28–0.84], $p=0.010$) and severe and/or extremely severe stress (aOR=0.35 [0.17–0.74], $p=0.006$) were significantly less likely to complete treatment over and above all other predictors (see Table 3).

Discussion

This study investigated client demographic, substance use, mental health, and treatment variables as predictors of treatment completion for residential substance use treatment. The observed overall treatment completion rate was 14.3%, consistent with previous estimates in residential treatment settings (Malivert et al., 2012). Mild to extremely severe stress was found to predict lower likelihood of treatment completion. No other demographic, substance use, mental health, or treatment variables predicted treatment completion in the adjusted analysis.

We found all levels of stress (mild to extremely severe) but not anxiety or depression had a negative impact on the likelihood of residential treatment completion. These results are inconsistent with Harley et al. (2018) who found depression, anxiety, and stress scores on the DASS-21 were not predictive of treatment completion. Harley et al. (2018) note the negative associations that financial and relationship stress have on treatment completion, indicating the important role stress plays in the outcome of residential treatment. The impact of stress on the continuation of SUDs has been documented (Sinha, 2008) and linked to increases in drug craving, drug-seeking behaviour, and risk of relapse (Fox et al., 2005, 2007; Sinha, 2001). While this link between stress and substance use is well

Table 3 Unadjusted and adjusted for all variables odds ratios for completion of the residential rehabilitation programme with multiple imputations for missing data ($n = 1056$)

| Factor | Unadjusted | | Adjusted for all variables | |
|--|-------------------|--------------|----------------------------|--------------|
| | OR (95% CI) | <i>p</i> | aOR (95% CI) | <i>p</i> |
| Intercept | | | 0.50 (0.21–1.15) | 0.103 |
| Age (ref: age 18–24) | | | | |
| Age 25 + | 0.72 (0.47–1.12) | 0.144 | 0.89 (0.53–1.46) | 0.653 |
| Sex (ref: female) | | | | |
| Male | 1.25 (0.86, 1.81) | 0.251 | 1.21 (0.81–1.79) | 0.353 |
| Site (ref: site 1) | | | | |
| Site 2 | 0.58 (0.40–0.84) | 0.004 | 0.74 (0.47–1.16) | 0.318 |
| Site 3 | 0.49 (0.29–0.83) | 0.008 | 0.62 (0.24–1.59) | 0.188 |
| Indigenous Australian status (ref: non-IA) | | | | |
| Indigenous Australian | 0.62 (0.40, 0.96) | 0.032 | 0.66 (0.30–1.47) | 0.310 |
| Primary drug (ref: cannabis) | | | | |
| Alcohol | 1.20 (0.71–2.05) | 0.497 | 0.94 (0.52–1.70) | 0.841 |
| Methamphetamine | 0.70 (0.39–1.24) | 0.220 | 0.64 (0.34–1.19) | 0.159 |
| Other | 1.31 (0.67–2.53) | 0.430 | 1.26 (0.60–2.63) | 0.540 |
| Injection use (ref: never injected) | | | | |
| Injected in lifetime | 0.66 (0.44–0.98) | 0.039 | 0.67 (0.42–1.08) | 0.097 |
| Justice involved (ref: non-justice) | | | | |
| Justice involved | 0.79 (0.55–1.15) | 0.217 | 0.90 (0.61–1.34) | 0.617 |
| Previous admissions (ref: no previous admission) | | | | |
| Any previous admissions | 0.73 (0.50–1.05) | 0.091 | 0.81 (0.55–1.19) | 0.277 |
| Polysubstance use (ref: no) | | | | |
| Polysubstance use (3 + drugs of concern) | 1.27 (0.73–2.21) | 0.392 | 1.42 (0.79–1.59) | 0.237 |
| Depression (ref: normal) | | | | |
| Mild and/or moderate | 0.68 (0.43–1.07) | 0.095 | 0.94 (0.55–1.60) | 0.813 |
| Severe and/or Extr. severe | 0.90 (0.58–1.40) | 0.640 | 1.74 (0.89–3.38) | 0.103 |
| Anxiety (ref: normal) | | | | |
| Mild and/or moderate | 0.90 (0.56–1.42) | 0.637 | 0.99 (0.59–1.67) | 0.971 |
| Severe and/or Extr. severe | 0.66 (0.42–1.04) | 0.073 | 0.96 (0.48–1.93) | 0.910 |
| Stress (ref: normal) | | | | |
| Mild and/or moderate | 0.57 (0.36–0.90) | 0.015 | 0.48 (0.28–0.84) | 0.010 |
| Severe and/or Extr. severe | 0.53 (0.33–0.85) | 0.008 | 0.35 (0.17–0.74) | 0.006 |
| Drug abstaining self-efficacy (ref: high) | | | | |
| Low drug abstaining self-efficacy | 0.62 (0.39–0.96) | 0.033 | 0.72 (0.43–1.60) | 0.212 |

Abbreviations: *non-IA* non-Indigenous Australian identifying, *Extr.* extreme, *OR* odds ratio, *aOR* adjusted odds ratio

Bold values represent statistical significance, $p < 0.05$

established, the stress clients experience when entering treatment has received relatively little attention. These findings highlight the importance of supporting high-stress individuals through critical risk periods at service entry, to help mitigate the risk of early discharge and improve treatment and substance use outcomes.

Prior studies have found a strong relationship between recurrent presentations to residential treatment and poorer outcomes (Decker et al., 2017), but we did not find a predictive relationship in the current study. The high rate of early discharge for behavioural misdemeanours ($n=284$; 27.2%) observed among this cohort indicates that discharge policy surrounding behavioural misdemeanours may indirectly lead to poorer substance use outcomes. Time in residential treatment represents a period of increased support and access to resources that target substance use, with treatment programmes effectively improving substance use outcomes (Andersson et al., 2019; Drake et al., 2011; Meier & Best, 2009). Complex strategies aimed at management of discharge resulting from behavioural misdemeanours should be explored to increase time in treatment and avoid elevating the risk of poorer substance use outcomes resulting from early discharge.

Our study included participants from three sites with varied programmes: site 1 for adults, site 2 for youth, and site 3 exclusively for Indigenous Australians. Residential treatment sites have inescapable heterogeneity due to differences in the clients, staff, and setting including the management structure, service running the facility, and treatment programmes being delivered, which are likely to play an important role in treatment outcomes (Meier & Best, 2009). Despite the varying treatment programmes in the current study, we did not find treatment site to have an impact on treatment completion. All included sites comply under similar organisational policy which may provide some uniformity; however, there are likely to be underlying site differences which we did not measure. Site factors such as client perceptions of orderliness and treatment involvement have been demonstrated to predict treatment completion in therapeutic communities for SUDs (Carr & Ball, 2014). Future research should investigate the impact of unique site characteristics such as differences in staff perspectives on individual client factors such as stress and treatment completion.

Limitations

While we highlight predictors of early discharge, this does not account for service engagement other than the current organisation. People who use substances often also present in other health care settings (SAMHSA, 2016). The extent of engagement with other health and drug service providers among this cohort is unknown. Our findings on the treatment completion rate may not be representative of the Australian system or other treatment sites. However, we assume that our findings on factors associated with treatment completion should be applicable to the broader treatment population.

We identified stress as a barrier to treatment completion but did not capture the nature or cause of this stress. Over half of the individuals in this study were measured to have levels of distress above normal on the DASS-21 at admission. Whether entry into treatment presented an acutely stressful period to individuals or pre-existing life factors influenced the presence of this stress is unknown. Future research investigating the mechanisms of stress prior to and while in treatment could present intervention targets to improve treatment completion outcomes.

Due to the small cell sizes for some of our study variables, some of our confidence intervals were wide. Within the residential sites used within the current study, individuals attended sites according to age status as young adult (18–25) or adult (25+). We analysed age as a categorical variable using these two age bins around the age requirements that were set by the residential sites. We did not have an adequate sample size to examine treatment completion in specific age groups above 25 years of age. Younger, middle-aged, and

older adults may have different factors that could impact their treatment completion, which warrants future research. We were only able to examine the impact of mental health symptoms (DASS) and drug-refusal self-efficacy (DTCQ) at admission on treatment completion. Missing data (50–60%) on the DASS and DTCQ of early leavers precluded analyses examining whether changes in depression, anxiety, stress, or refusal self-efficacy at discharge predicted treatment completion. Future work on how to better collect meaningful data to inform better outcomes for clients in residential treatment is warranted.

Implications and Future Research

Research that utilises administrative health service data to investigate client pathways and trajectories before and after time in residential substance use treatment is needed to further understand treatment incompleteness. Data linkage is an approach to better understand the patterns of engagement with different treatment service providers and other services over time for individuals. Data collection at discharge was limited in the current study, with high levels of missing data from early leavers. Using data linkage to investigate the precursors and outcomes of residential treatment that extend past treatment may allow a more nuanced understanding of treatment pathways. Health services such as other drug and alcohol services, emergency services, and hospitals provide the opportunity to extend the scope of an individual's health and substance use outcomes before and after treatment. Furthermore, the linkage of mortality and incarceration data allows a follow-up of outcomes and activities in individual trajectories.

Conclusion

Residential treatment is for individuals with moderate to severe SUDs who often have other complex needs. The high levels of early discharge, readmissions, and associated poorer treatment and substance use outcomes among this cohort need to be urgently addressed. Stress was highly prevalent within the cohort at admission and predictive of poorer treatment completion. Individuals with high stress when entering treatment require greater support to mitigate early risk of discharge through high-risk periods, such as adjusting to treatment. Emphasising mental health support that includes the management of clinical distress before and during treatment may provide the opportunity to impact progression throughout and following treatment. Further research investigating time in-between and following presentations to treatment is needed to investigate the mechanisms that underlie the reduced likelihood of treatment completion that is predicted by stress.

Appendix 1

Table 4 Treatment completion and predictor variables by missing data on the DASS and DTCQ-8 at admission

| | Missing DASS (<i>n</i> = 213) | Missing DTCQ (<i>n</i> = 257) |
|------------------------------|-----------------------------------|-----------------------------------|
| Treatment completion | | |
| Non-complete | 91.4% | 91.5% |
| Complete | 8.6% | 8.50% |
| Age | | |
| 18–24 | 18.8% | 23.2% |
| 25 + | 81.2% | 76.8% |
| Sex | | |
| Male | 67.6% | 64.6% |
| Female | 32.4% | 35.4% |
| Site | | |
| Site 1 | 36.2% | 30.4% |
| Site 2 | 42.7% | 42.0% |
| Site 3 | 0.0% | 0.0% |
| Indigenous Australian status | | |
| Non-IA | 49.3% | 50.0% |
| IA | 50.7% | 50.0% |
| Primary drug of concern | | |
| Alcohol | 48.3% | 50.2% |
| Meth | 25.6% | 24.5% |
| Cannabis | 18.2% | 17.1% |
| Other | 7.9% | 8.2% |
| Injecting drug use | | |
| Never | 72.6% | 71.0% |
| Yes | 27.4% | 29.0% |
| Legal status | | |
| None | 41.8% | 40.9% |
| Justice involved | 58.2% | 59.1% |
| Previous episode(s) | | |
| No | 82.6% | 81.7% |
| Yes | 17.4% | 18.3% |
| Polysubstance use | | |
| No | 93.4% | 94.2% |
| Yes | 6.6% | 5.8% |

Appendix 2

Table 5 Participant demographic, substance use, mental health, and treatment characteristics, and psychological factors pooled over twenty multiple imputations (*n* = 1056)

| | Total | | Completion status of total | |
|------------------------------|--------------|-------|----------------------------|----------------------------------|
| | <i>n</i> | Col % | <i>n</i> complete | Completion (%) % of completed |
| Treatment completion | | | | |
| Completion | 151 | 14.3% | - | - |
| Non-completion | 905 | 85.7% | - | - |
| Age at admission | | | | |
| Mean (SD) | 32.04 (9.55) | | | |
| 18–24 | 245 | 23.2% | 28 | 11.40% |
| 25+ | 811 | 76.8% | 123 | 15.20% |
| Sex | | | | |
| Female | 360 | 34.1% | 45 | 12.50% |
| Male | 696 | 65.8% | 106 | 15.20% |
| Site | | | | |
| Site 1 | 351 | 33.2% | 68 | 19.4% |
| Site 2 | 507 | 48.0% | 62 | 12.2% |
| Site 3 | 198 | 18.8% | 21 | 10.6% |
| Indigenous Australian status | | | | |
| Non-Indigenous Australian | 757 | 71.7% | 117 | 15.5% |
| Indigenous Australian | 299 | 28.3% | 34 | 11.4% |
| Principal drug | | | | |
| Cannabis | 150 | 14.2% | 21 | 13.9% |
| Alcohol | 420 | 39.8% | 70 | 16.7% |
| Methamphetamine | 368 | 34.8% | 39 | 10.6% |
| Other | 119 | 11.3% | 21 | 17.6% |

Table 5 (continued)

| | Total | | Completion status of total | | |
|--------------------------------|-------|-------|----------------------------|----------------|----------------|
| | n | Col % | n complete | Completion (%) | |
| | | | | Completion (%) | % of completed |
| Injecting drug use | | | | | |
| Never injected | 720 | 68.2% | 114 | 15.3% | 75.5% |
| Injected in lifetime | 336 | 31.8% | 37 | 12.5% | 24.5% |
| Legal status | | | | | |
| None | 673 | 63.7% | 103 | 15.3% | 68.2% |
| Justice involved | 383 | 36.3% | 48 | 12.5% | 31.8% |
| Previous admissions | | | | | |
| 0 | 662 | 62.7% | 104 | 15.7% | 68.9% |
| 1 + | 394 | 37.3% | 47 | 12.3% | 31.1% |
| Polysubstance use | | | | | |
| No | 957 | 90.6% | 134 | 14.0% | 88.7% |
| 3 + drugs of concern | 99 | 9.4% | 17 | 17.2% | 11.3% |
| Admission DASS | | | | | |
| Depression | | | | | |
| Normal | 337 | 31.9% | 54 | 16.0% | 35.8% |
| Mild and/or moderate | 353 | 33.4% | 43 | 12.2% | 28.5% |
| Severe and/or extremely severe | 365 | 34.6% | 54 | 14.8% | 35.8% |
| Anxiety | | | | | |
| Normal | 330 | 31.3% | 54 | 16.4% | 35.8% |
| Mild and/or moderate | 330 | 31.3% | 47 | 14.2% | 31.1% |
| Severe and/or extremely severe | 396 | 37.5% | 50 | 12.6% | 33.1% |

Table 5 (continued)

| | Total | | Completion status of total | |
|--------------------------------|----------|-------|----------------------------|----------------------------------|
| | <i>n</i> | Col % | <i>n</i> complete | Completion (%) % of completed |
| Stress | | | | |
| Normal | 456 | 43.2% | 83 | 18.2% 55.0% |
| Mild and/or moderate | 311 | 29.5% | 37 | 11.9% 24.5% |
| Severe and/or extremely severe | 290 | 27.5% | 32 | 11.0% 21.2% |
| Admission DTCC | | | | |
| Low abstinence self-efficacy | 873 | 82.7% | 116 | 13.3% 76.8% |
| High abstinence self-efficacy | 183 | 16.4% | 35 | 2.02% 23.2% |

Score cut-offs for the DASS-21: depression 0–9 normal, 10–12 mild, 14–20 moderate, 21–27 severe, 28+extremely severe; anxiety 0–7 normal, 8–9 mild, 10–14 moderate, 15–19 severe, 20+extremely severe; stress 0–14 normal, 15–18 mild, 19–25 moderate, 26–33 severe, 34+extremely severe. Score cut-offs for the DTCCQ8: 0–79 low abstinence self-efficacy, 80+high self-efficacy.

Author Contribution All authors contributed to conceptualisation and made significant intellectual contributions to the study. Analysis and the first draft of the manuscript were written by Calvert Tisdale. All authors critically reviewed and contributed to all manuscript drafts. All authors contributed to and have approved the final manuscript.

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Data Availability The dataset generated and analysed during the current study is not publicly available due to the sensitivity surrounding deidentification of participants involved.

Declarations

Ethics Approval De-identified data was received and approved by The University of Queensland Human Research Ethics Committee (approval number: 2018001063).

Conflict of Interest CT is completing a funded PhD scholarship from the service provider in the current study. JL, DD, and LH have no conflicts of interest to declare.

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