

Residential Rehabilitation for the Treatment of Heroin Dependence: Sustained Heroin Abstinence and Drug-Related Problems 2 Years After Treatment Entrance

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Abstract

To determine levels of sustained heroin abstinence, current drug use, and drug-related problems of residential rehabilitation (RR) admissions 24 months after entering treatment. Longitudinal cohort study of 100 heroin users admitted to short-term (1 month) or long-term (3–6 months or longer) RR. Separation in the first week was uncommon in both short-term (7%) and long-term (16%) programs. Eighteen percent successfully graduated, 47% self-discharged, and 30% were expelled. Postindex treatment exposure was widespread (82%), with additional RR the most common treatment. At 24 months, 71% were heroin abstinent over the month preceding interview, and 18% reported heroin abstinence over the entire follow-up period. There had been large declines in levels of recent needle borrowing, crime, psychopathology, and improvements in global and injection-related health. Independent predictors of continuous heroin abstinence were female sex (odds ratio [OR] 5.00), successful graduation from the index program (OR 9.05), and post-treatment MT exposure (OR 0.08). The study confirms the effectiveness of RR and highlights the impact of program graduation.

Key Words: heroin, treatment, residential rehabilitation, abstinence

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The treatment of heroin dependence presents a major clinical problem. In Australia, this is illustrated by the fact that more people are treated for opioid dependence than for any other drug, including alcohol.¹ Heroin dependence, moreover, is a remarkably persistent condition.^{2–4} A recent 33 year follow-up of US heroin users reported

that a fifth were still active users, even though they were now in their late 50s, and half were deceased.³ These figures reflect the substantially elevated mortality rates associated with heroin use⁵ that result from factors such as overdose, disease, trauma, psychopathology, and suicide.^{3,4,6,7}

Residential rehabilitation (RR) is a major component of the drug treatment system for heroin dependence in Australia.¹ RR is a drug free treatment modality, requiring residence in the treatment agency, subsequent to having undertaken detoxification. Programs may be of short (approximately 1 month) or longer (at least 3–6 months) duration and are based upon group therapy, with possible adjunct Narcotics Anonymous meetings. The aim of both program types is sustained abstinence from heroin and other drugs.

As a treatment modality, RR is more costly than outpatient pharmacotherapy.^{8,9} The average daily cost per individual for RR in Australia was recently calculated to be A\$98 per day, compared with A\$11 per day for opioid agonist maintenance programs.⁸ This creates pressure upon agencies to demonstrate efficacy to justify government spending on RR. These costs, however, must be seen in the context of the clinical profile of entrants to RR. Although the profile of entrants to all heroin treatment modalities is poor, RR entrants typically have more serious drug dependence and drug-related problems.^{10–12}

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Despite the poor clinical profile of RR clients, clinical improvements associated with RR have been demonstrated amongst US, UK, and Australian samples.^{11,13,14} Gossop et al¹⁴ recently reported that half of RR clients in the UK based National Treatment Outcome Study were heroin abstinent in the period immediately preceding 12 months follow-up, as were 70% of RR clients from the Australian Treatment Outcome Study (ATOS).¹³ The levels of abstinence seen at 12 months are certainly encouraging. The aim of RR, however, is to achieve stable abstinence. In consideration of the persistence of heroin use, abstinence at follow-up points may not truly reflect heroin use patterns over the entire follow-up period. A period of abstinence immediately before follow-up may, in fact, be an exception rather than a reflection of stable, sustained abstinence. Only a quarter of those in the ATOS cohort who were heroin abstinent at 12 month follow-up had been so for the entire 12 month period,¹³ with a similar pattern being reported by Sheehan et al¹⁵ in the UK.

One factor repeatedly associated with better treatment outcome is longer retention time.^{11,14,16–18} As noted above, however, RR programs differ substantially in length. Does this mean that superior outcome will be associated with longer retention in long-term programs? The picture appears to be more complex than this. Retention for a least 3 months has been associated with superior outcome in US programs.¹⁹ Gossop et al¹⁴ noted better outcome amongst those who stayed 90 days in British long-term programs (>3 mo) and also for those who stayed 28 days or more in shorter programs (<3 mo). The results of Gossop et al¹⁴ indicate that retention must be seen in the context of the intended treatment length. Moreover, the circumstances of treatment separation may be crucial. Successful completion of a RR program (“graduation”), as opposed to self-discharge or expulsion, may be a major factor independent of program length or

retention time per se. Thus, a longer period ending in expulsion may be less efficacious than a shorter stay that ends in graduation.

The current study aimed to examine index retention and separation circumstances of RR admissions in ATOS, subsequent treatment experiences over 24 months, the drug use of the cohort at 24 months, and levels of drug-related problems (e.g., crime). In particular, the study aimed to ascertain levels of sustained heroin abstinence over 24 months and to examine the role of index treatment in such an outcome.

Specifically, the study aimed to

1. Ascertain the treatment histories of RR entrants over 24 months postindex admission;
2. Determine levels of sustained heroin abstinence, current drug use, and drug-related problems at 24 months post-treatment admission; and
3. Determine factors associated with continuous heroin abstinence between treatment admission and 24 months follow-up.

MATERIALS AND METHODS

Procedure

The data were collected from the New South Wales component of ATOS. Baseline interviews were conducted between February 2001 and August 2002. ATOS is a longitudinal study of entrants to treatment for heroin dependence, recruited from randomly selected treatment agencies delivering maintenance treatment, detoxification, or RR. The current paper focuses on entrants to RR. The RR entrants were recruited from 4 randomly selected drug free agencies in the greater Sydney region. The agencies comprised 2 short-term programs (approximately 1 mo duration) and 2 long-term programs (approximately 3–6 months duration). Treatment retention was determined by file audits of participating agencies, and reason for discharge was also ascertained.

Participants were interviewed at baseline, 3, 12, and 24 months. Eligibility criteria were 1) no treatment for heroin dependence in the preceding month, 2) no imprisonment in the preceding month, and 3) participant agreed to give contact details for follow-up interviews.

ATOS relies on self-reported drug use. Hair sampling, however, was conducted at 3 month follow-up interview of 61 randomly selected participants (approximately 10% of the baseline sample) as a bio-marker for heroin use over the month preceding interview. The overall agreement between self-reported heroin use and the presence of morphine in hair was 75% ($\kappa = 0.49$). In 15% of discrepancies, heroin use was reported but morphine not detected. In only 10% of cases was recent heroin use denied but morphine detected. Because of logistical constraints, no hair sampling was conducted at other times throughout the follow-up period.

Structured Interview

Baseline

Subjects were administered a structured interview that addressed demographics, treatment history, drug use history, heroin overdose history, and psychopathology. Drug use, needle risk-taking, injection-related health problems, and criminal behaviours over the month preceding interview were measured using the Opiate Treatment Index.²⁰

General physical and mental health were measured using the Short-Form 12 (SF12).²¹ The SF 12 has a mean of 50 and a standard deviation of 10, with lower scores indicating poorer physical or psychological health. DSM IV diagnoses of heroin dependence and current Major Depression were obtained using the Composite International Diagnostic Instrument (CIDI).²²

24 Month interview

The 24 month interview was an abbreviated form of the baseline interview.

Participants were asked how many times they had begun treatment, in any modality, for heroin dependence since baseline interview and the time spent in each treatment episode. The cumulative number of treatment days (in any modality) was calculated. Current drug use, injection related risk behaviours, injection-related health problems, and criminality in the month preceding interview were measured by the Opiate Treatment Index. Participants were asked about heroin overdoses in the period since baseline. The SF12 was re-administered to obtain a measure of current general physical and mental health. DSM IV diagnoses of current Major Depression were obtained using the CIDI.

Statistical Analyses

t tests were used for continuous data. Paired *t* tests were used to examine differences between baseline and follow-up for continuous variables. Where distributions were highly skewed, medians were reported and Mann-Whitney *U* tests conducted. For categorical variables, odds ratios (OR) and 95% confidence intervals (CI) were calculated. The McNemar test for paired proportions was used to examine differences in proportions between baseline and follow-up. To determine independent predictors of continuous heroin abstinence, logistic regressions with backward elimination were performed. The Hosmer-Lemeshow statistic was used to determine goodness of fit of the final model. All analyses were conducted using SPSS for Windows (release 12.0.1, Chicago, IL).²³

RESULTS

Sample Characteristics

A total of 100 (75%) of the cohort of 133 RR entrants were successfully reinterviewed at 24 months. A further 6 (5%) were known to be incarcerated, and 4 (3%) were deceased. At baseline, the mean age of those successfully followed-up was 28.0 (SD 6.9, range 18–49) years, and 65% were male. Ninety-three percent had been enrolled in

treatment for opiate dependence before ATOS, with no significant difference between males (91%) and females (97%). At baseline, 32% met criteria for current Major Depression.

The mean length of heroin use career at baseline was 9.2 (SD 7.0, range <1–31) years, and 67% had been daily heroin users over the month preceding baseline interview. The sample had used a mean of 9.6 (SD 1.4, range 5–11) drug classes in their lives and 5.1 (SD 1.6, range 2–9) in the month preceding interview.

There were no significant differences between long and short-term program entrants in age, sex, length of heroin use career, polydrug use, criminality, global psychological distress, or major depression. The only significant difference between entrants was that those in longer-term programs were more likely to have used heroin on a daily basis over the month preceding index treatment (76% vs. 45%, OR 3.84, CI 1.54–9.56).

Comparisons of those re-interviewed with those lost to follow-up indicated there were no differences in age, heroin use, previous treatment enrolment, criminal involvement, or global mental health.

Index Treatment Retention

The median retention time in the short-term index programs was 15 (range 4–39) days and 60 (range 3–291) days for those enrolled in long-term programs (Table 1). Separation within the first week was uncommon in both short-term (7%) and long-term (16%) programs. Amongst entrants to long-term programs, 61% were retained for 30 days or longer. There were no sex differences in retention times.

The most common separation circumstance was self-discharge (47%), whereas 30% were expelled (Table 1). Eighteen percent successfully graduated, including 35% of those in short-term program and 10% of those in long-term programs. There were no differences in sex or age

TABLE 1. Treatment Status and Exposure at 24 Months Follow-Up

	Males (n = 65)	Females (n = 35)	All (n = 100)
Index treatment			
Days retained			
Short-term program (mdn)	15	20	15
Long-term program (mdn)	64	47	60
All programs (mdn)	60	30	28
Separation (%)			
Graduated	15	24	18
Self discharge	45	50	47
Expelled	36	21	30
Referred to other treatment	5	3	4
Prison	3	0	1
Currently in treatment (%)	20	31	24
MT	14	29	19
DTX	2	0	1
RR	5	3	4
Postindex treatment (%)	85	77	82
MT	46	51	48
DTX	37	26	33
RR	55	51	55
No. treatment episodes (24 mths) (mdn)	3	3	3
No. days in any treatment (24 mths) (mdn)	200	190	191

mdn indicates median.

between those who graduated and those who did not.

Postindex Treatment

Postindex treatment exposure was widespread (82%) and was the norm among both sexes (Table 1). The most common postindex treatment was RR (55%). Twenty-four percent were currently enrolled in a drug treatment program at 24 months, most commonly maintenance (methadone or buprenorphine). The median time in any form of treatment over the study period was 191 (range 7–869) days over a median of 3 treatment episodes (range 1–16).

Drug Use and Drug-Related Problems at 24 Months

Heroin and other drug use

At 24 months, 71% of the cohort were abstinent from heroin over the month preceding interview (Table 2). Daily heroin use was reported by 12% of the RR cohort, a significant decline from the 67% reported

at baseline. There was no difference between short or longer-term programs in either current heroin abstinence (72% vs. 70%) or daily use (10% vs. 13%). There were also no significant difference between males and females in the proportions who were heroin abstinent at 24 months (69% vs. 74%), or who were daily heroin users (12% vs. 12%). The large decline in heroin use was marked at 3 month follow-up, and the overall proportion reporting current heroin abstinence remained constant at each subsequent follow-up point (Fig. 1). Of those who had been heroin abstinent at 12 month interview, 84% subsequently reported heroin abstinence at 24 month interview.

Heroin abstinence over the entire first year after index treatment admission was reported by 25% of participants, with no significant sex difference (male 22%, female 34%). At 24 months, 18% of the cohort reported continuous heroin abstinence, with males less likely to do so (11% vs. 31%, OR 0.26, CI 0.09–0.76).

TABLE 2. Drug Use and Drug-Related Problems at 24 Months Follow-Up

Outcome Measure	Baseline	24 Months	Comparisons
Drug use			
Heroin			
Current heroin abstinent (% 1 mo)	2	71	$\chi^2 = 65.1, P > 0.001$
Daily heroin use	67	12	$\chi^2 = 45.3, P > 0.001$
Other drugs			
Amphetamines	38	12	$\chi^2 = 17.4, P < 0.001$
Cocaine	32	3	$\chi^2 = 25.3, P < 0.001$
Cannabis	70	35	$\chi^2 = 28.9, P < 0.001$
Benzodiazepines	51	15	$\chi^2 = 25.5, P < 0.001$
Alcohol	59	52	NS
No. drug classes used (1 mo)	5.1	2.6	$t_{99} = 11.4, P > 0.001$
Needle risk-taking (% 1 mo)			
Daily injections	76	12	$\chi^2 = 58.4, P > 0.001$
Borrowed used needles	32	2	$\chi^2 = 25.3, P > 0.001$
Crime (% 1 mo)	56	13	$\chi^2 = 34.6, P > 0.001$
Health			
SF12 physical health score (1 mo)	44.1	50.3	$t_{99} = 4.5, P > 0.001$
Injection-related health problem (% 1 mo)	83	18	$\chi^2 = 56.1, P < 0.001$
Overdosed (% previous 12 mths)	33	11	$\chi^2 = 12.4, P < 0.001$
Psychopathology			
SF12 mental health scores (1 mo)	28.1	41.9	$t_{99} = 9.7, P > 0.001$
Current major depression (%)	32	8	$\chi^2 = 18.9, P < 0.001$

NS, not significant.

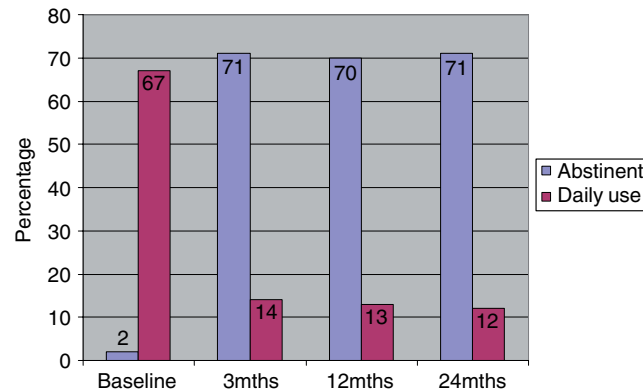


FIGURE 1. Heroin use at baseline, 3, 12, and 24 months.

Polydrug use declined from a mean of 5.1 drug classes in the month preceding baseline to 2.6 in the month preceding 24 month follow-up (Table 2), with no sex difference. In addition to reductions in heroin use, there had been substantial reductions in the use of amphetamines, cocaine, cannabis, and benzodiazepines. The proportion reporting current alcohol use had remained stable (Table 2).

Risk-taking

The proportion injecting daily declined significantly from 76% to 12% at 24 months follow-up (Table 2), with no significant sex difference. Recent injecting with borrowed used equipment declined markedly from 32% to 2%, again with no sex difference at 24 months.

Crime

There had been substantial reductions in criminality (Table 2). Over half of the cohort had committed criminal acts in the month preceding ATOS enrolment compared with 13% at 24 month follow-up. The large reduction in criminality was evident amongst both male and females, with no sex difference.

Health

SF12 physical health scores improved by over half a standard deviation so that the mean score at 24 months was now identical

to that of the general population (Table 2). At baseline, 83% of the cohort reported current injection-related health problems. At 24 months, this had declined to 18% of participants, with no significant gender difference. The proportion who had experienced a heroin overdose in the year preceding 24 month interview was substantially lower than reported in the year preceding index treatment (33% vs. 11%) (Table 2).

Psychopathology

SF12 mental health scores improved by more than 1 standard deviation (Table 2). Scores remained lower than those of the general population, indicating ongoing higher level of current psychologic distress than seen among the general population. Similarly, the prevalence of current major depression declined significantly from 32% to 8% at 24 month follow-up. There were no significant sex differences in psychopathology at 24 month follow-up.

Factors Associated with Continuous Heroin Abstinence over 24 Months

Because the primary aim of RR was to achieve sustained heroin abstinence, factors associated with abstinence over the follow-up period were examined (Table 3). As noted above, 18% of the cohort reported heroin abstinence over the entire follow-up period. Those who maintained heroin

Table 3. Factors Associated with Continuous Heroin Abstinence over 24 Months Among RR Entrants

Variable	Abstinent (n = 18)	Heroin Use (n = 82)	Comparisons
<i>Demographics</i>			
Age	29.7	27.6	NS
Sex (% male)	39	71	OR 0.26 (0.09–0.76)
<i>Treatment exposure</i>			
Index			
Program type (% longer-term)	72	71	NS
Days in index treatment	58	28	$U = 466, P < 0.017$
Graduation status (% graduated)	50	10	OR 9.3 (2.9–30.0)
Graduated (%)	53	47	
Expelled (%)	10	90	
Self-discharged (%)	9	91	
Postindex			
MT	6	37	OR 0.10 (0.01–0.81)
DTX	6	39	OR 0.09 (0.01–0.73)
RR	33	57	NS
No. treatment episodes (24 mo)	2	3	$U = 396, P < 0.01$
Baseline drug use			
Daily heroin use (%)	72	65	NS
Polydrug use	4.3	5.2	$t_{98} = 2.3, P < 0.05$

MT indicates maintenance treatment; DTX, detoxification; NS, not significant.

abstinence were more likely to be female but did not differ in age at ATOS enrolment. The abstinent had been retained in their index treatment for twice as long as those who relapsed and were 9 times more likely to have graduated from their program. Continuous abstinence was not related to program type.

Those who maintained abstinence had fewer treatment episodes over the follow-up period and were significantly less likely to have enrolled in a subsequent detoxification or maintenance program (Table 3). Baseline heroin use did not distinguish between those who maintained heroin abstinence and others, but the abstinent participants were using fewer drug classes at intake.

To determine independent predictors of sustained abstinence, logistic regressions were performed. Variables entered into the initial model were age, sex, program type, index treatment days, graduation status, postindex RR exposure, postindex MT exposure, postindex DTX exposure, baseline heroin use, and baseline polydrug use. The final model was significant ($\chi^2 = 27.2,$

$P < 0.001$) and had a good fit (Hosmer-Lemeshow $\chi^2 = 5.7, P > 0.4$). After taking into account the effects of other variables, being female (OR 5.00, CI 1.42–17.54) and having successfully graduated from the index program (9.05, CI 2.39–34.30) were independently associated with maintained abstinence, whereas having had post-treatment MT exposure was associated with reduced odds of abstinence (OR 0.08, CI 0.01–0.72).

DISCUSSION

The current study demonstrated substantial improvements among RR entrants in drug use and a range of drug-related problems 24 months after treatment admission. Nearly 1 in 5 reported sustained heroin abstinence over the entire follow-up period. Despite the widespread exposure of the cohort to subsequent treatment episodes, the impact of index treatment on subsequent relapse to heroin use was evident in both univariate and multivariate analyses.

Within both the short- and longer-term index treatments, separation within the first week was uncommon. Only a minority (18%), however, successfully graduated from their index program, with self-discharge the most common means of separation. In fact, a larger proportion were expelled from their index treatment than graduated. The cohort was exposed to extensive treatment over the follow-up period, with the majority subsequently enrolled in further treatment episodes. The fact that there was extensive movement between treatment modalities over the follow-up period indicates that the various treatment modalities do not service discrete populations. Heroin users move freely between drug free treatment, detoxification, and maintenance therapies.

The clinical picture at 24 months was vastly different to that seen at baseline: nearly three quarters were not using heroin, and only 12% were using daily. Consistent with the decline in heroin use, overdose rates, crime, needle sharing, injection-related problems, and psychopathology all declined substantially. The decline in heroin use was pronounced at 3 month follow-up and remained remarkably consistent at subsequent follow-up points. What makes this altered profile so remarkable is the severity of the baseline clinical profile.

Of particular note, 18% reported sustained heroin abstinence over the entire follow-up period. Thus, at 24 month follow-up, three quarters of the cohort were currently heroin abstinent, and a fifth had been so since baseline. There was a large sex difference, with 31% of females reporting sustained abstinence compared with 11% of males. Multivariate analyses indicated that this was not an artifact of differences in treatment retention or graduation. After taking treatment circumstances into account, females still appeared 5 times more likely to have achieved sustained abstinence.

Despite the subsequent treatment history of the cohort, the role of their index

treatment in the achievement of sustained abstinence was clearly demonstrated. Similar to other studies,^{11,14,16-18} longer index treatment retention times were associated with better treatment outcome, in this case, sustained heroin abstinence. The circumstances of separation, however, were also vitally important. After controlling for the effects of other variables, those who successfully graduated from their index program were 9 times more likely to achieve sustained abstinence. In fact, multivariate analyses indicated that graduation was more important for sustained abstinence than retention time per se or program type. Thus, a longer retention time ended by self-discharge or expulsion may not be as strongly related to the achievement of abstinence as a successfully completed shorter program. How a treatment episode ends is clearly a major factor in subsequent outcome.

It is important to note that the type of index RR entered was *not* related to the heroin use at 24 months. Entrants to shorter or longer index RR programs were equally likely to be heroin abstinent at 24 months and to have maintained abstinence since baseline. Again, it was successful graduation, and not program type, that predicted sustained abstinence. It should be noted that, although entrants to longer programs reported heavier baseline heroin use, the overall clinical profile of the two groups was similar. Overall, two similar groups of heroin users appeared to have similar outcomes at 24 months, regardless of index program type.

The fact that subsequent treatment was associated with reduced odds of sustained abstinence may merely reflect that relapse led to more treatment. More broadly, however, the results are consistent with previous studies demonstrating that fewer treatment episodes are associated with better overall treatment outcome.^{13,14} The current study confirms that stable retention is important for treatment outcome but further demonstrates that stable,

successfully graduated RR treatment is associated with best outcome.

Failure to achieve sustained abstinence over follow-up was also associated with heavier baseline polydrug use. In fact, of the drug use variables, it was polydrug use that was associated with sustained abstinence. Extensive polydrug use among heroin users has been consistently associated with poorer clinical profiles.²⁴ The difficulty for those treating heavy polydrug users is that the primary drug problem is nested in a wide range of other drug use patterns, and polydrug use is strongly associated with psychopathology.²⁴ It was encouraging then that there had been substantial reductions in polydrug use. The reductions in heroin use were not matched by increases in the use of other drugs.

Despite the general improvement in clinical profile at 24 months and the substantial treatment exposure of the cohort, a high degree of harm was still evident among these long-term heroin users. Approximately 1 in 8 were injecting daily, had current injection-related health problems, and were committing crime. Although the rate was substantially reduced, a 10th of the cohort had overdosed in the preceding year, with consequent exposure to hypoxia and other overdose-related morbidity.²⁵ The average psychological health of the cohort remained at levels far below that of the general population, and 8% met diagnostic criteria for current major depression, a level still exceeding that of the general population.²⁶

The current study has implications for agencies providing RR. First, the study clearly demonstrates that the experience of RR impacts positively upon drug use and drug-related problems despite the poor baseline clinical profile of the clients. The study also demonstrates the importance of successful retention, and of graduation in particular, in achieving sustained abstinence. The fact that males were substantially less likely to maintain heroin abstinence suggests that strategies should be directed

at retaining these clients and achieving successful graduation.

In interpreting the results, a caveat should be borne in mind. No biomarkers were collected at 12 and 24 month interview to confirm self-reported heroin use, and it was not feasible to collect biomarkers to cover the entire follow-up period. As such, caution needs to be exercised in interpreting reported abstinence rates. Comparative hair analyses of a subsample of the cohort at 3 month interview, however, showed respectable concordance with self report. In fact, consistent with the broader literature,²⁷ most discordance was from reported use not being detected by hair analysis. In addition, the broader literature on the validity of self-reported drug use indicates self-reported drug use has high levels of validity for data collected within the research setting.²⁷

In summary, the clinical profile of RR entrants at 24 months post-treatment admission was vastly superior to that seen at baseline. Heroin use was at levels similar to that seen at 12 months, and nearly 1 in 5 reported sustained heroin abstinence since baseline. The study confirms the effectiveness of RR, the importance of treatment retention, and, in particular, the impact of program graduation.

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