

Regular article

Factors affecting detoxification readmission: Analysis of public sector data from three states

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Received 12 June 2005; received in revised form 12 May 2006; accepted 15 May 2006

Abstract

The objective of this study was to understand the rate of detoxification readmissions and the factors associated with readmission within a public sector population. The study sample was drawn from an integrated database that includes Medicaid and state mental health and substance abuse agency data from three states (Delaware, Oklahoma, and Washington) for 1996–1998. Clients with at least one state agency-sponsored detoxification event in 1996 or 1997 were included in the study. Twenty-seven percent of the sample was readmitted for detoxification within 1 year of their index detoxification. Clients who received two or more substance-abuse-related services within 30 days of their index detoxification were less likely to be readmitted and had a longer time until their second detoxification admission. Detoxification readmission is common in the public sector. Engaging patients in treatment following detoxification may reduce readmission rates and time to readmission. © 2006 Elsevier Inc. All rights reserved.

Keywords: Detoxification; Readmission; Publicly funded substance abuse treatment

1. Introduction

Detoxification services are often clients' first introduction to the publicly funded substance abuse treatment system (Edmunds et al., 1997). Such services are intended to help clients stop the use of alcohol or other drugs relatively quickly, while minimizing withdrawal symptoms (Gerstein & Harwood, 1990). As such, detoxification is an

acute medically based intervention for people with substance use dependence (SUD), but it does not constitute treatment for SUD in and of itself. Comprehensive treatment entails rehabilitation and recovery services following detoxification (Institute of Medicine, 1990).

In 2001, the United States witnessed 443,000 admissions to specialty substance abuse organizations for detoxification, accounting for 24% of all admissions to specialty substance abuse facilities, according to the Treatment Episode Data Set (TEDS). There were 377,000 additional admissions to general hospitals for detoxification in 2001, according to data from the National Inpatient Sample Healthcare Cost Utilization Project. Detoxification is often an important gateway to services that support recovery; however, evidence indicating that detoxification is often not followed by treatment for SUD exists. For example, according to data from the TEDS, 28% of patients admitted to a substance abuse facility dropped out of treatment

This article was presented at the American Public Health Association Meeting in Washington, DC, in 2004.

The views expressed here do not necessarily represent those of the SAMHSA or the Department of Health and Human Services.

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(Substance Abuse and Mental Health Services Administration, 2006).

When detoxification is not followed by SUD treatment, there is an increased risk that patients will need detoxification again. This has been referred to as the detoxification “revolving door.” The reasons for this revolving door are not well understood (Franken & Hendricks, 1999). Most research studies have focused on outcomes and readmissions related to substance abuse rehabilitation and maintenance treatment, rather than on detoxification per se. The reasons why people cycle through detoxification may differ, however, from the reasons why substance abuse rehabilitation is sometimes unsuccessful (Franken & Hendricks, 1999).

Generalization from research on detoxification readmissions is somewhat problematic due to small sample sizes and methodological issues (Callaghan & Cunningham, 2002a). However, studies have suggested that severity of addiction, severity of medical problems, type of drug use, and previous history of detoxification may be factors (Callaghan, 2003; Callaghan & Cunningham, 2002a, 2002b; Franken & Hendricks, 1999). In addition, lack of stable housing (Callaghan, 2003; Callaghan & Cunningham, 2002a, 2002b) and higher out-of-pocket costs for follow-up treatment (McCarty, Caspi, Panas, Krakow, & Mulligan, 2000; Stein, Orlando, & Sturm, 2000) have been associated with an increased risk of detoxification readmission.

Client engagement in continuing substance abuse rehabilitation following detoxification has been shown to influence the probability of redetoxification. Research has shown that patients who receive postdischarge treatment have better outcomes in terms of both drug abstinence (McCusker, Bigelow, Luippold, Zorn, & Lewis, 1995) and readmission rates (Daley, Argeriou, & McCarty, 1998). However, past studies have indicated that only about 20–50% of clients receive continuing substance abuse treatment following detoxification (Chutuape, Jasinski, Fingerhood, & Stitzer, 2001; Mark, Dilonardo, Chalk, & Coffey, 2003; McCusker et al., 1995; Oklahoma Department of Mental Health and Substance Abuse Services, 2006).

Linkages between detoxification and subsequent substance abuse rehabilitation may be affected by treatment system characteristics. A survey of state Medicaid programs in the late 1990s found that only 15 states had established formal written procedures to link patients completing detoxification to substance abuse treatment (Office of Evaluation and Inspections, Office of Inspector General, U.S. Department of Health and Human Services, 1998). Although most of the remaining states had informal processes in place to link clients completing detoxification to substance abuse treatment, it was not clear how effective these informal processes were. In the late 1990s, most states reported collecting no data on time elapsed between detoxification and engagement in substance abuse treatment. Survey respondents in seven states indicated that lack of continuity of substance abuse service delivery was a

concern. According to data from the National Survey of Substance Abuse Treatment Services, about 58% of substance abuse facilities that offer detoxification have outcome follow-up; however, the nature and the extent of follow-up were not indicated in the survey.

This study further explores the issue of detoxification readmission. Our focus was on clients receiving publicly funded detoxification, which is provided through state mental health and substance abuse (MH/SA) agencies. This population is of inherent interest from a public policy standpoint, given the large role played by public payers in substance abuse treatment. Approximately 76% of substance abuse treatment is funded by public sources, and 38% of that is funded by state and local governments (Mark et al., 2005).

With this as background, the present research had two central objectives: to determine the rate of detoxification readmission among clients receiving publicly funded detoxification, and to identify the factors associated with detoxification readmission. Based on the existing literature, we hypothesized that the receipt of SUD treatment following detoxification would protect against readmission for detoxification.

2. Materials and methods

The study uses a unique database, called the Integrated Database (IDB), that combines information from state Medicaid programs, mental health agencies, and substance abuse agencies at the client level. The compilation of this database was sponsored by the Substance Abuse and Mental Health Services Administration (SAMHSA).

The IDB contains data from three states—Delaware, Oklahoma, and Washington—and covers services from 1996 to 1998. The database designers employed specific criteria in building the IDB, such that the resulting database includes individuals with explicit and implied mental or substance use disorders (Coffey et al., 2001). All clients who received services from the states’ MH/SA agencies were included in the database. Medicaid enrollees in the participating states were included in the IDB if they satisfied any one of three conditions: (1) with a primary or secondary MH/SA diagnosis on a claim; (2) receiving an MH/SA service based on procedure or revenue codes; or (3) receiving any service from an MH/SA provider. A probabilistic linking algorithm was used to match the records for the same individuals across agencies (Whalen, Pepitone, Graver, & Busch, 2000).

The IDB contains all Medicaid claims and agency service records. This includes services rendered in outpatient, residential, and inpatient settings. The database also includes basic demographic information from agency files. Enrollment and demographic information are included for individuals with any Medicaid eligibility during the period 1996–1998. To protect confidentiality, the final IDB

employs unique pseud identifiers rather than personal identifiers (such as name or social security number).

For this study of detoxification readmission, the sample population consisted of all clients in the IDB with at least one state agency detoxification event occurring in 1996 or 1997. IDB service category codes and state-specific provider codes were used to identify detoxification services in state MH/SA agency records. The earliest state agency detoxification event for each subject was defined as the index event.

Index detoxification events were categorized as outpatient, residential, or inpatient, based on place of service and the provider information available on agency service records. The length of an index detoxification event was also calculated. This was straightforward for inpatient and residential detoxification services because the IDB included discharge dates. Outpatient services, however, may have entailed several days of detoxification separated by days with no services. Thus, we used a gap of 5 days or more with no detoxification to identify the end of an outpatient detoxification event.

To identify clients with ongoing treatment, we assessed treatment follow-up after index detoxification. Specifically, we examined whether clients received substance abuse

treatment, either through Medicaid or state agencies, subsequent to detoxification. *Treatment* was defined as the presence of two or more substance-abuse-related services within 30 days after the end of the index detoxification event. Medicaid claims with a primary alcohol or drug diagnosis (*International Classification of Diseases, Ninth Revision, Clinical Modification* [ICD-9-CM] code 291.x, 292.x, 303.x, 304.x, or 305.x) were counted as substance-abuse-related services. Most state agency records did not include specific diagnostic information. Substance abuse agency records were counted as substance-abuse-related services unless they carried a primary diagnosis code of nonsubstance abuse mental health condition because state substance abuse agencies primarily provide substance-abuse-related services. Emergency department visits and subsequent detoxification services were not counted toward treatment.

The study period was defined as the year after discharge from the index (initial) detoxification event. Detoxification readmissions during the study period were identified using both Medicaid and state agency data. Medicaid detoxification claims were identified as those carrying the ICD-9-CM procedure code 94.62, 94.63, 94.65, 94.66, 94.68, or 94.69, or a local procedure code indicative of detoxification. The same method employed to identify the index detoxification

Table 1
Characteristics of study subjects and index detoxification events

Characteristics	All states		Delaware		Oklahoma		Washington	
	No.	% (SD)	No.	% (SD)	No.	% (SD)	No.	% (SD)
Study subjects	22,054	100	3,329		5,958		12,767	
State								
Delaware	3,329	15.1						
Oklahoma	5,958	27.0						
Washington	12,767	57.9						
Gender								
Male	15,574	70.6	2,502	75.2	4,234	71.1	8,838	69.2
Female	6,480	29.4	827	24.8	1,724	28.9	3,929	30.8
Mean age (years)	36.4	(10.0)	34.1	(9.9)	35.3	(9.6)	37.5	(10.1)
Race								
Caucasian	15,740	71.4	1,946	58.5	3,982	66.8	9,812	76.9
African American	3,787	17.2	1,242	37.3	1,177	19.8	1,368	10.7
American Indian	1,489	6.8	27	0.8	674	11.3	788	6.2
Hispanic	694	3.2	61	1.8	112	1.9	521	4.1
Other	344	1.7	53	1.6	13	0.2	278	2.2
Medicaid eligibility at some point during 1996–1998								
Yes	4,473	20.3	740	22.2	599	10.1	3,134	24.5
No	17,581	79.2	2,589	77.8	5,359	89.9	9,633	75.5
Index event								
Place of service								
Outpatient	19	0.1	0	0	19	0.4	0	0
Residential	21,816	98.9	3,329	100	5,722	96.0	12,765	100.0
Inpatient	219	1.0	0	0	217	3.6	2	0.0
Mean length (days)								
All	5.7	(13.2)	7.6	(20.3)	6.2	(3.1)	4.9	(13.7)
Outpatient	6.1	(4.0)	0	(0)	6.1	(4.0)	0	(0)
Residential	5.6	(13.3)	7.6	(20.3)	6.2	(3.1)	4.9	(13.7)
Inpatient	6.9	(4.0)	0	(0)	6.9	(4.0)	9.0	(1.4)
Follow-up treatment								
Yes	5,934	26.9	802	24.1	2,122	35.6	3,010	23.6
No	16,120	73.1	2,527	75.9	3,836	64.4	9,757	76.4

event in the state agency data was also used to check for detoxification readmissions in the study period. The number of subjects with at least one detoxification readmission in the study period was tabulated. The number of subjects readmitted for detoxification within 30, 60, 90, 180, and 365 days of index detoxification was also determined. Finally, the characteristics of subjects who were and were not readmitted within the study period were compared.

Finally, survival analyses were conducted to determine the effect of several factors on time to detoxification readmission. Specifically, the SAS PHREG procedure (SAS Institute, Cary, NC) was used to perform regression analysis of survival data based on the Cox proportional hazards model. Cox's semiparametric model is widely used in the analysis of survival data to explain the effects of explanatory variables on hazard rates. The dependent variable was coded as the days from the end of index detoxification to the first detoxification readmission. For people with no readmission, the gap was coded as the number of days from the end of index detoxification to the date of the last known claim for that person. A flag indicating censored records was set for people without a readmission. Independent variables included demographic information; length of index detoxification (LOS; in days); and flags indicating Medicaid eligibility, inpatient setting for index detoxification, and engagement in follow-up services. Continuous variables (age, age-squared, and LOS) were modeled as the difference between specific values and the mean for that variable. In one model, we included all study subjects and used state as an additional covariate. We also ran separate models for each state because of interstate variation in the provision of substance abuse services.

3. Results

Clients totaling 22,054, who had at least one state agency detoxification event in 1996 or 1997, were identified in the IDB. The characteristics of the study sample are presented in Table 1. The majority of these clients (58%) were from Washington State, with lesser numbers from Oklahoma (27%) and Delaware (15%). More than two thirds of the study subjects were male. The mean age of subjects was 36 years (more than 98% were 18 years or older). The racial/ethnic breakdown of the study sample was 71% Caucasian, 17% African American, 7% Native American, 3% Hispanic, and 2% Other. Eligibility data indicated that about 20% of subjects were eligible for Medicaid at some point during the years 1996–1998.

Table 1 also displays the characteristics of the sample by state. Some notable differences across states include the fact that, in Delaware, more than one third of the sample is African American, and, in Oklahoma, only 10% of the sample was Medicaid-eligible.

Table 1 also presents the characteristics of the index detoxification event for the study population. For nearly all

Table 2
Clients with detoxification events in the study period

Variables	No.	% (SD)
Index event		
Place of service		
Outpatient	19	0.1
Residential	21,816	98.9
Inpatient	219	1.0
Mean length (days)		
All	5.7	(13.2)
Outpatient	6.1	(4.0)
Residential	5.6	(13.3)
Inpatient	6.9	(4.0)
Follow-up treatment		
Yes	5,934	26.9
No	16,120	73.1
Clients by detoxification readmission status following index detoxification in the study period ^a		
Detoxification readmission(s) within 30 days ^a	1,715	7.8
Detoxification readmission(s) within 60 days	2,561	11.6
Detoxification readmission(s) within 90 days	3,175	14.4
Detoxification readmission(s) within 6 months	4,388	19.9
Detoxification readmission(s) within 1 year	5,906	26.8
No detoxification readmission(s) within 1 year	16,148	73.2
Total	22,054	100.0

^a Refers to the presence of one or more additional detoxification events within the specified time frame after the index detoxification event.

subjects (98.9%), the index detoxification event occurred in a residential setting. Index detoxifications in an outpatient setting comprised only 0.1% of all index events, and those in an inpatient setting comprised only 1%. The mean length of the index detoxification event was 5.7 days. About 27% of subjects began treatment (i.e., had two or more substance abuse services) following their index detoxification event. The lowest rate of follow-up was in Washington State (24%), and the highest rate was in Oklahoma (36%).

Approximately 27% of the sample had one or more detoxification readmissions within 1 year following their initial detoxification (Table 2).

Table 3 compares the characteristics of subjects with and without a detoxification readmission during the study period. Significant differences were noted by state, with fewer clients from Oklahoma having detoxification readmissions in the study period as compared with clients from Delaware and Washington. Clients with a detoxification readmission were significantly more likely to be male (28.1% male patients readmitted vs. 23.6% female patients readmitted; $p < .0001$). Older age was also significantly associated with readmission, although the difference was small (37.0 vs. 36.1 years; $p < .0001$). The distribution of clients by race and ethnicity differed among those readmitted and those with no detoxification events subsequent to the index event: Higher percentages of Caucasians and Hispanics experienced detoxification readmissions in the study period. Clients with a readmission were more likely to have Medicaid eligibility than those with no readmission in the study period. The difference in the mean length of stay

of index admission was not significantly different between the two groups. Of note is the fact that significantly fewer clients who received follow-up treatment were readmitted (24.9% follow-up clients readmitted vs. 27.5% nonfollow-up clients readmitted; $p = .0001$).

The results of the survival analyses of clients from all three states suggested that female clients had a 25% longer time to a second detoxification (Table 4). Time to detoxification also differed by race. African Americans had almost a 20% longer time to detoxification, whereas Hispanics had more than a 20% shorter time to detoxification, as compared with Caucasians. Older age was associated with a shorter time to detoxification. Clients with any Medicaid eligibility were found to experience a longer time to detoxification. Inpatient detoxification lengthened the time to a second detoxification. The length of index detoxification was not significant. Follow-up treatment increased the time to a second detoxification admission by 40% ($p < .0001$).

The multivariate results, for all states, are included in Table 4 (results by individual state are available from the

Table 4

Factors affecting time to detoxification readmission, in all three IDB states

Variables	Hazard ratio	SE	χ^2	p
State: Delaware	1.114	0.04	8.76	.003
State: Oklahoma	0.618	0.04	168.8	<.0001
Gender: female	0.756	0.03	82.7	<.0001
Age	1.018	0.007	5.8	.02
Age squared	1.00	0.000	2.6	.11
Race: African American	0.81	0.04	31.2	<.0001
Race: Hispanic	1.218	0.07	7.1	.008
Race: Native American	0.89	0.06	3.9	.05
Race: Other	0.81	0.11	3.8	.05
Any Medicaid eligibility	0.657	0.03	173	<.0001
Place of service of index detoxification: inpatient	0.622	0.18	6.8	.009
Length of index detoxification	1.00	0.000	0.97	.32
Follow-up treatment	0.60	0.03	276	<.0001

senior author). In all three states, the time to a subsequent detoxification event was longer if the patients received follow-up treatment. The effect was greatest in Washington (the largest state; with a hazard ratio of 0.55) and was smallest in Delaware (with a hazard of 0.79).

Table 3

Characteristics of clients with detoxification readmissions

Characteristics	Clients with two or more detoxification events within a year		Clients with only one detoxification event within a year		p
	No.	% (SD)	No.	% (SD)	
Study subjects	5,906	26.8	16,148	73.2	
State					
Delaware	1,070	32.1	2,259	67.9	<.0001
Oklahoma	993	16.7	4,965	83.3	
Washington	3,843	30.1	8,924	69.9	
Gender					
Male	4,375	28.1	11,199	71.9	<.0001
Female	1,531	23.6	4,949	76.4	
Mean age (years)	37.0	(9.6)	36.1	(10.2)	<.0001
Race					
Caucasian	4,373	27.8	11,367	72.2	<.0001
African American	915	24.2	2,872	75.8	
American Indian	339	22.8	1,150	77.2	
Hispanic	192	27.7	502	72.3	
Other/unknown	87	25.3	257	74.7	
Medicaid eligibility at some point during 1996–1998					
Yes	1,374	30.7	3,099	69.3	<.0001
No	4,532	25.8	13,049	74.2	
Index event					
Place of service					
Outpatient	0	0.0	19	100.0	<.0001
Residential	5,877	26.9	15,939	73.1	
Inpatient	29	13.2	190	86.8	
Mean length (days)					
All	5.6	(14.7)	5.7	(12.6)	.9767
Outpatient	0.0	–	6.1	(4.0)	–
Residential	5.6	(14.8)	5.6	(12.7)	.9886
Inpatient	7.9	(3.5)	6.8	(4.1)	.1753
Follow-up treatment					
Yes	1,477	24.9	4,457	75.1	.0001
No	4,429	27.5	11,691	72.5	

4. Discussion

Data from the three states showed that about 27% of the clients had one or more detoxification events in the year following their index detoxification. In comparison, a survey of state Medicaid programs revealed that the average rate of readmission of Medicaid beneficiaries to detoxification within 1 year was 47%, with a range of 23–93% (Office of Evaluation and Inspections, Office of Inspector General, U.S. Department of Health and Human Services, 1998). Callaghan and Cunningham (2002a) examined the records of 2,595 consecutive admissions to a Canadian detoxification program and noted that 60% of clients had a prior detoxification admission. Participants in a small study at a Baltimore, MD, detoxification program reported a mean of two prior detoxifications (Chutuape et al., 2001). The high readmission rates in these two studies may relate to close tracking of study participants over time. Our study results are further evidence that detoxification readmissions are common.

We had hypothesized that clients who received two or more substance abuse services following discharge from detoxification would be less likely to be readmitted for detoxification in the study period and to have a longer time to readmission. This hypothesis was supported by our study results. The descriptive statistics, for the entire database and for each individual state, showed that patients who received postdetoxification substance abuse services were significantly likely to be readmitted and to have a longer time to readmission when that did occur.

Our results also need to be understood in terms of certain limitations of the database used for this study. Index

detoxification was the first detoxification noted in the 1996 or 1997 period; however, this event may not have been the first detoxification experienced by the individual. The IDB does not include clinical information; thus, so we were not able to control for case mix. Specific diagnosis codes that would have allowed us to differentiate between types of substance use disorders (e.g., alcohol dependence and opioid abuse) were missing in most cases and, therefore, were not included in our analysis. Thus, we were unable to distinguish complex from simple cases. We also could not measure psychiatric and medical comorbidity as part of this study, although these factors may affect the results of detoxification and substance abuse treatment. In addition, we considered all types of detoxification together, although specific programs and the type of detoxification employed may affect outcomes.

In cases where no detoxification readmission was noted in the study period, we were unable to determine with certainty that there was, in fact, no readmission. It is possible that clients moved or obtained services outside the publicly funded programs included in the IDB. We also suspect that not all Medicaid detoxification events were captured using procedure codes because the incidence of detoxification events in the Medicaid data was lower than expected. Finally, we were not able to measure client participation in programs such as Narcotics Anonymous and Alcoholics Anonymous because these programs are not tracked by state agencies.

Finally, one might question the age of the data. Although the data are close to 10 years old, there is no reason to expect that the relationship between follow-up treatment readmissions is likely to have changed since the late 1990s. Recent data from the [Oklahoma Department of Mental Health and Substance Abuse Services \(2006\)](#) suggest that follow-up rates have not changed significantly over time.

Despite these data-related limitations, we feel that this study is an important addition to the literature on detoxification. That additional treatment following detoxification can be a deterrent to redetoxification has many potential clinical and policy implications. Information about patient risk factors for redetoxifications may be especially useful to service providers, allowing them to tailor programs for at-risk groups to decrease the likelihood of readmission. Policy makers should consider purchasing strategies and incentives at the system level to reduce repeated detoxification costs by facilitating better engagement in treatment and recovery services.

Additional research in this area would be beneficial. Assessing the effect of psychiatric comorbidities on detoxification readmission and determining the types of postdetoxification substance abuse rehabilitation services associated with decreased risk of readmission are two areas that warrant further investigation.

There are some important examples of policy makers' efforts to encourage greater postdischarge follow-up. For example, the Washington Circle Group, under the direction

of the SAMHSA, has been working on developing performance measures for addiction treatment (McCorry, Garnick, Bartlett, Cotter, & Chalk, 2000). Preliminary measures include treatment "retention," which examines follow-up after discharge. Similar measures have been implemented for mental health conditions as part of Health Plan Employer Data and Information Set (HEDIS). Implementation of such measures and incentives for improvement are clearly needed to promote efforts to engage patients in treatment following detoxification.

Acknowledgment

This study was funded by the SAMHSA.

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