Addictive Behaviors xxx (2011) xxx–xxx

Contents lists available at ScienceDirect

Addictive Behaviors

Days to treatment and early retention among patients in treatment for alcohol drug disorders

Kim A. Hoffman [a,*], James H. Ford [b,1], Carrie J. Tillotson [a,2], Dongseok Choi [a,3], Dennis McCarty [a,4]

[a] Oregon Health & Science University, Portland, OR, United States
[b] University of Wisconsin, Madison, WI, United States

ARTICLE INFO

Available online xxxx

Keywords:
Substance abuse treatment and delivery
Process improvement
Wait time
Retention in care

ABSTRACT

Objectives: Drug and alcohol treatment programs often have long delays between assessment and treatment admission. The study examined the impact of days to treatment admission on the probability of completing four sessions of care within an addiction treatment program implementing improvements in their admission process.
Methods: Mixed-effects logistic regression was used to test the effect of wait time on retention in care.
Results: Findings demonstrate a strong decrement in the probability of completing four sessions of treatment with increasing time between the clinical assessment and first treatment session.

1. Introduction

Many individuals who seek treatment for alcohol and drug disorders do not keep their first treatment appointment and substantial numbers of those who begin care leave treatment before completing the program (Capoccia et al. 2007). Gaps between service need and service capacity contribute to delays in treatment entry and continued alcohol and drug use.

There are societal and individual implications for delayed treatment including risk for serious health complications, criminal involvement, preventable health care utilization and the disbursement of social program benefits such as unemployment and welfare (Carr et al., 2008; Ettner et al., 2006; Palepu et al., 2001). Missed appointments and early dropouts also contribute to financial inefficiencies among addiction treatment programs; limited resources, such as counselor time, are invested in patients who enter and do not return to treatment. The high rate of appointment failures is a paradox of "overbooked" staff and a seemingly overburdened treatment facility while, in reality, counselors often wait in their offices for clients who never arrive (Gallant, Bishop, Stoy, Faulkner, & Paternostro, 1966).

Client characteristics have a negligible influence on treatment initiation and compliance—attributes such as legal pressure (Hser, Maglione, Polinsky, & Anglin, 1998), having dependents at home (Leigh, Ogborne, & Cleland, 1984; Orme & Boswell, 1991), family or social stability (Hser et al., 1998; Leigh et al., 1984), health plan coverage (Hser et al., 1998), and prior successful treatment experience (Hser et al., 1998) play only a modest role. Drug and alcohol treatment agencies, therefore, must use organizational and policy changes to improve initiation and retention in care (Appel, Ellison, Jansky, & Oldak, 2004; Condelli, 1994; Miller, 1985).

The Institute of Medicine (2001) report suggested that defective processes were a primary cause of poor quality health care. The report called for health care organizations to assess and transform their delivery systems and make substantial improvements in organizational processes. In recent years, efforts have focused on understanding these organizational processes in substance abuse treatment settings and how they affect treatment initiation, continuation, and discharge. It is a substantial barrier to recovery when clients are forced to wait for entry into treatment (Appel et al., 2004; Farabee, Leukefeld, & Hays, 1998). Reducing the wait time between the first contact and the initial visit is an easy and inexpensive intervention that has proven successful in increasing treatment engagement in alcohol

* Corresponding author at: Department of Public Health and Preventive Medicine, Oregon Health & Science University, 3181 SW Sam Jackson Park Rd. CB 669, Portland, OR 97239, United States. Tel.: +1 503 494 0016; fax: +1 503 494 4981.
E-mail addresses: hoffmaki@ohsu.edu (K.A. Hoffman), jay.ford@chess.wisc.edu (J.H. Ford), tillotso@ohsu.edu (C.J. Tillotson), choid@ohsu.edu (D. Choi), mccartyd@ohsu.edu (D. McCarty).
[1] Department of Industrial Engineering, University of Wisconsin, Madison, 1513 University Avenue, Madison, WI 53706, United States. Tel.: +1 608 262 4748; fax: +1 608 263 4523.
[2] Oregon Clinical & Translational Research Institute, Oregon Health & Science University, Mail Code: CR-145, 3181 SW Sam Jackson Park Road, Portland, OR 97239-3098, United States. Tel.: +1 503 494 1169; fax: +1 503 418 0125.
[3] Division of Biostatistics, Department of Public Health & Preventive Medicine, Oregon Health & Science University, 3181 SW Sam Jackson Park Rd. CB 669, Portland, OR 97239, United States. Tel.: +1 503 494 5336; fax: +1 503 494 4981.
[4] Department of Public Health and Preventive Medicine, Oregon Health & Science University, 3181 SW Sam Jackson Park Rd. CB 669, Portland, OR 97239, United States. Tel.: +1 503 494 1177; fax: +1 503 494 4981.

0306-4603/$ – see front matter © 2011 Elsevier Ltd. All rights reserved.
doi:10.1016/j.addbeh.2011.01.031

(Fleming & Lewis, 1987; Leigh et al., 1984; Miller, 1985; Rees, Beech, & Hore, 1984; Thom et al., 1992), drug (Addenbrooke & Rathod, 1990; Benjamin-Bauman, Reiss, & Bailey, 1984; Claus & Kindleberger, 2002; Festinger, Lamb, Kirby, & Marlowe, 1996; Festinger, Lamb, Kountz, Kirby, & Marlowe, 1995; Festinger, Lamb, Marlowe, & Kirby, 2002; Stark, Campbell, & Brinkerhoff, 1990), and mental health (Gallucci, Swartz, & Hackerman, 2005; Orme & Boswell, 1991) treatment facilities.

Less attention has been given to retention in care beyond the first treatment session. In small short-term studies, longer wait times appear to negatively impact attendance beyond the first treatment (Leigh et al., 1984; Rees et al., 1984; Woody, O'Hare, Mintz, & O'Brien, 1975), although this is not a universal finding (Addenbrooke & Rathod, 1990; Alterman, Bedrick, Howden, & Maany, 1994; Festinger et al., 1996; Stasiewick & Stalker, 1999). Woody et al. (1975) found that opiate dependent clients who completed intake within 3 days after initial contact had a higher continuous retention in methadone treatment at months 2, 3, 4, and 5. Failure to attend treatment for alcohol dependence was more likely with more than 14 days delay from assessment to first appointment (Leigh et al., 1984). Similarly, shorter wait time to first appointment was associated with more treatment visits for alcohol dependence (Rees et al., 1984).

1.1. Network for the improvement of addiction treatment

The NIATx (Network for the Improvement of Addiction Treatment) began as a partnership between the Robert Wood Johnson Foundation's Paths to Recovery program, the Center for Substance Abuse Treatment's Strengthening Treatment Access and Retention program, and addiction treatment agencies across the U.S. It is the first widespread application of process improvement techniques to the organization and delivery of treatment services for alcohol and drug dependence. Community-based addiction treatment centers submitted proposals to either the Robert Wood Johnson Foundation (RWJF) or the Substance Abuse and Mental Health Services Administration's Center for Substance Abuse Treatment (CSAT) to participate in NIATx. Awards were made to 10 agencies from RWJF for 18 months, and 13 from CSAT for 36 months in the initial round of awards (cohort 1); and 15 agencies from RWJF for 18 months in a second round of awards (cohort 2). For details on the selection of NIATx member sites and data collection, see McCarty et al. (2007) and Hoffman et al. (2008).

NIATx helps substance abuse and mental health treatment organizations improve consumer access to and retention in treatment. Participants learn to implement rapid cycle improvements, monitor impacts and modify the intervention until the desired effect is achieved. Through its learning community, NIATx tests the effectiveness of adopting and sustaining organizational process improvements through four aims: 1) reduce wait time between first request for service and treatment; 2) reduce client no-shows; 3) increase admissions; and 4) increase continuation rates between first and fourth treatment sessions. Evaluation efforts have documented that process improvement activities, including reducing client waiting time for treatment, can lead to significant improvements in access to treatment and in retention (McCarty et al., 2007). Agencies applying the NIATx process improvement model utilize an agency walkthrough procedure to identify key problems. Change teams used rapid cycle change initiatives to test changes that addressed deficits in admission processes. See the project website for more information about NIATx (www.niatx.net).

In this analysis, relationships between treatment entry delays and treatment attrition rates are examined among treatment admissions that completed at least one treatment session in treatment agencies that participated in NIATx. Quicker treatment entry following assessment was expected to increase the likelihood of clients completing at least 4 treatment sessions.

2. Methods

2.1. Sample

This analysis uses data from outpatient treatment units from both cohorts of data collection—cohort 1, with data collected during the 15 months from October 2003 to December 2004; and cohort 2, with data collected during the 15 months from January 2005 to March 2006. The analysis was limited to (a) cases with a drug or alcohol dependence diagnosis, and (b) those who were admitted during the intervention period for reducing waiting time. We examined data gathered from 15 of 17 agencies with outpatient treatment units; 2 agencies were excluded from analysis due to data quality problems. Five of the 15 agencies belonged to cohort 1, and 10 agencies belonged to cohort 2. Of the 6698 total requests for outpatient treatment assessments, 583 had a first contact (initial telephone call requesting care) but no clinical assessment; an additional 874 had no first treatment session, or an invalid first treatment date ($n=4$, first treatment date reported as prior to clinical assessment date), and thus were excluded from analysis. Finally, due to the wide range and skewed distribution of wait times, measured as number of days from clinical assessment to first treatment (0–384 days), we limited the analysis to only individuals who had wait times of 30 days or less ($n=4937$; 94% of those with valid first treatment date). Therefore, the final sample included 15 agencies with a total of 4937 requests for outpatient treatment assessments, ranging from 124 to 887 requests per agency.

2.2. Variables

Data were extracted from the agency information system on: a) dates of the first contact, treatment assessment, and first treatment session; b) attendance at the second, third, and fourth treatment sessions (yes/no); c) primary drug; d) court mandated to care; e) age, race, ethnicity, and gender; and f) month during funding period in which first contact took place. The primary independent variable of interest was wait time (number of days from treatment assessment to first treatment). The outcome, retention in care, was defined as attendance at the second, third, or fourth outpatient treatment sessions. Group and individual treatment sessions were counted as treatment sessions.

2.3. Statistical analysis

Descriptive statistics for patient characteristics and variables of interest were first calculated for the entire study sample, as well as by agency. Differences in wait time between those attending and not attending each treatment session were first analyzed by 2-tailed, independent samples *t*, Mann Whitney *U*, or chi-square test where appropriate. Mixed-effects logistic regression (McCulloch, Searle, & Neuhaus, 2008) was used to test the effect of wait time on retention in care. We used mixed-effects logistic regression models due to the hierarchical structure of the data – that is, patients clustered within agencies – and because this type of model incorporates both fixed and random effects. In the model, intercept, linear and quadratic trends for wait time were treated as random-effects. We also included fixed effects for a linear trend for month; differences between cohorts; an interaction between wait time and month to test whether the relationship between retention in care and wait time changed over the course of the 15 month study periods; and an interaction between wait time and cohort to test whether the relationship between retention and wait time was different for the two cohorts. Model-based estimated percentages of patients attending each treatment session by wait time, month, and cohort, were calculated using the fitted results of the mixed effects models; we report percent change in

Please cite this article as: Hoffman, K.A., et al., Days to treatment and early retention among patients in treatment for alcohol drug disorders, *Addictive Behaviors* (2011), doi:10.1016/j.addbeh.2011.01.031

retention rates for wait times between 0 and 30 days for each subgroup of month and cohort.

We were not able to adjust for patient characteristics due to large amounts of missing data (see Table 1). Five of the fifteen agencies were missing more than 50% of the data on each of the demographic characteristics; two of the five were missing all data on all demographics. Because of this, we could not impute and did not deem it feasible to exclude all cases with missing data.

The study was approved by the Oregon Health and Science University's Institutional Review Board. Data management and analyses were conducted using SAS software Version 9.2 (SAS Institute Inc., 2008) and R Statistical Language (R Development Core Team, 2008). All statistically significant results were significant at $p<.05$.

3. Results

The 4937 admissions included 67% men, 51% age 30 years and less and 57% court involved individuals. Primary drugs included alcohol (40%), cocaine (11%), marijuana (27%), methamphetamine (15%), and opioids (5%), while 2% reported use of other drugs. Wait time in days from clinical assessment to first treatment averaged 8.3 (SD 7.6) days, ranging from 0 to 30 days (capped at 30), with approximately one-quarter (26.5%) of all patients having clinical assessment and first treatment on the same day (wait time = 0 days).

Patients from the 15 outpatient treatment agencies had retention rates of 77%, 62%, and 49% at the second, third, and fourth treatment sessions, respectively. Retention rates varied by agency; maximum retention rates by agency for second, third, and fourth treatment sessions were 95%, 94%, 91%, respectively, while minimum retention rates for sessions 2, 3, and 4 were 48%, 23%, and 9%, respectively (see Table 1). Wait times were consistently longer by approximately 1 to 2 days among those who did not attend treatment sessions two, three, and four, compared to those who did attend subsequent treatment sessions ($p<0.001$). Nearly half of clients (45.3%) waited more than a week and 8.9% waited more than 21 days to attend their first treatment session. As expected, there was a significant association between retention at the second, third, and fourth sessions of outpatient treatment and wait time [see Table 2].

Table 1
Characteristics of patients over all agencies.

	All 15 agencies (N = 4937)	By agency		% missing, all agencies
		Minimum	Maximum	
Wait time in days				
Mean (SD)	8.3 (7.6)	2.2 (4.9)	14.4 (5.6)	0%
Median (IQR)	7 (0–14)	0 (0–0)	14 (8–20)	0%
Retained in care				
Treatment session 2	77%	48%	95%	0%
Treatment session 3	62%	23%	94%	0%
Treatment session 4	49%	9%	91%	0%
Male[a]	67%	47%	72%	19%
Age ≤ 30[a]	51%	15%	64%	37%
White[a]	76%	3%	92%	19%
Hispanic[a]	9%	1%	26%	19%
Court involved[a]	57%	0.3%	100%	19%
Primary Drug[a]				23%
Alcohol	40%	15%	55%	–
Cocaine	11%	2%	23%	–
Marijuana	27%	8%	36%	–
Methamphetamine	15%	0.0%	36%	–
Opioids	5%	0.2%	18%	–
Other drugs	2%	0.0%	19%	–

Notes: SD = standard deviation; IQR = interquartile range.
[a] Percentages for demographic data by agency and for all agencies were calculated excluding data from agencies with more than 50% missing on demographics.

3.1. Multivariate analysis

In mixed-effects logistic regression models accounting for wait time, month, and cohort, results varied by treatment session. Table 3 presents the estimated probability of retention in treatment sessions two, three and four, and demonstrates the multifaceted pattern of results quantitatively. For all treatment sessions, during all month intervals, and for both cohorts, retention in care was lower for wait times of 30 days than for wait times of 0 days, with one exception: treatment session 2, cohort 2, shows little difference in retention rates across wait time and month intervals (over all months, 85.8% retention for 0 days wait time vs. 84.6% retention for 30 days wait time). Note that the percent change in retention from 0 wait days to 30 wait days was consistently greater for cohort 1 than for cohort 2. The greatest differences were seen for treatment session four, where overall retention rates from 0 to 30 days differed by a factor of 96% for cohort 1, and 40% for cohort 2. Additionally, cohort 2 had higher retention rates at all time points than cohort 1.

Statistical results of the mixed-effects models are presented in Table 4. In all treatment sessions, we found reduced retention rates for longer wait times, and a differential effect by cohort (session 2, $\beta=0.053$, SE = 0.191, $p=0.003$; session 3, $\beta=0.040$, SE = 0.020, $p=0.049$; session 4, $\beta=0.081$, SE = 0.024, $p=0.001$). In addition, for treatment sessions 2 and 3, the association of increased wait time and decreased retention rates was mediated by month ($\beta=-0.004$, SE = 0.001, $p=0.001$ and $\beta=-0.003$, SE = 0.001, $p=0.002$, respectively); differences in retention rates by wait time late in the funding periods (e.g. months 11–15) tended to be higher than differences seen early in the funding periods (months 1–5). For treatment session 4, there were no significant differences in the relationship between wait time and retention by month ($\beta=-0.002$, SE = 0.001, $p=0.132$).

To further demonstrate these complex relationships, Fig. 1 graphically presents the relationship between wait time and retention in care at the fourth treatment session for all agencies, grouped into three 5-month time intervals, by cohort. For both cohorts 1 and 2, we see a strong decrement in the probability of completing four sessions of treatment with increasing time between the clinical assessment and first treatment session. However, the reduction in retention is greater for cohort 1 and, even at low wait times (e.g. 0 days), and retention rates in cohort 1 are low compared to cohort 2.

4. Discussion

The study examined the impact of days to treatment admission on the probability of completing four sessions of care within an addiction treatment program implementing improvements in their admission process. In this analysis, relationships between treatment entry delays and treatment attrition rates were examined among treatment admissions that completed at least one treatment session in treatment agencies that participated in NIATx. Quicker treatment entry following assessment was expected to increase the likelihood of clients completing at least 4 treatment sessions. The findings support our hypothesis that as treatment providers improved their wait times to treatment over the course of their participation in NIATx, concurrent improvements in retention in care occurred. Waiting for treatment is an all too common event for women and men seeking treatment for alcohol and drug disorders. Delayed treatment entry significantly reduced retention through four treatment sessions. These results support the use of process improvements to reduce days to admission, enhance retention in care and improve the availability of treatment for alcohol and drug disorders (McCarty et al., 2007). The improvements in retention rates also suggest a potential for applying process improvement techniques to other areas of drug and alcohol treatment and imply that process improvement in care delivery is possible in large and complex organizations.

Please cite this article as: Hoffman, K.A., et al., Days to treatment and early retention among patients in treatment for alcohol drug disorders, *Addictive Behaviors* (2011), doi:10.1016/j.addbeh.2011.01.031

Table 2
Differences in wait time (days from clinical assessment to first treatment session) by retention in care.

	Treatment session 2		Treatment session 3		Treatment session 4	
	No (n = 1133)	Yes (n = 3804)	No (n = 1884)	Yes (n = 3053)	No (n = 2500)	Yes (n = 2437)
Wait time[a]						
Mean (SD), in days	9.7 (8.0)	7.8 (7.4)	9.7 (7.8)	7.4 (7.4)	9.4 (7.7)	7.1 (7.4)
Median (IQR)	8 (2–15)	7 (0–13)	8 (3–14)	6 (0–12)	8 (3–14)	6 (0–12)
0–7 days wait time, no. (%)	527 (46.5)	2175 (57.2)	871 (46.2)	1831 (60.0)	1188 (47.5)	1514 (62.1)
8–20 days wait time, no. (%)	467 (41.2)	1330 (35.0)	807 (42.8)	990 (32.4)	1054 (42.2)	743 (30.5)
21–30 days wait time, no. (%)	139 (12.3)	299 (7.9)	206 (10.9)	232 (7.6)	258 (10.3)	180 (7.4)

Note: SD = standard deviation; IQR = interquartile range. Column percentages may not add to 100% due to rounding to the nearest tenth.
[a] Differences in wait time between those attending and not attending each respective treatment session are significant at $p<0.001$.

4.1. Limitations and implications

Participants in NIATx applied to participate and the application process selected for agencies that demonstrated an interest and commitment to making process improvements. As a result, these findings may not generalize to all programs. Moreover, the agencies in this study made a wide variety of improvements and it is not clear which changes were responsible for the observed improvements.

We also were unable to assess the impact of patient characteristics on retention in care, due to large amounts of missing data on patient demographics. It is possible that patients with certain characteristics may be more likely to enter into and continue treatment. For example, patients with a court-mandate to enter into drug treatment may have been more likely to also be retained through four sessions of care.

The sample consists of individuals who completed an assessment and one treatment session and does not include individuals who requested services but did not receive an assessment, or those who received an assessment and were admitted to services but did not attend the first treatment session. Nevertheless, the findings confirm that time to treatment is associated with the length of treatment.

In the United States there are more than 14,000 specialty clinics for the treatment of alcohol and drug disorders. State and local public

Table 3
Estimated[a] percentage of patients retained in treatments 2, 3, and 4, by cohort, month, and wait time.

Treatment session	Cohort	Month	Wait time (clinical assessment to Tx1)				% change (from 0–30 days)
			0 days %	10 days %	20 days %	30 days %	
Treatment session 2	Cohort 1 (n = 1669)	Months 1–5	64.2	61.7	52.6	37.1	−42.21%
		Months 6–10	69.6	63.0	49.3	30.0	−56.89%
		Months 11–15	74.5	64.3	46.0	23.7	−68.12%
		Overall	69.4	63.0	49.3	30.3	−56.38%
	Cohort2 (n = 3268)	Months 1–5	82.8	88.0	89.6	88.5	6.92%
		Months 6–10	86.0	88.6	88.3	84.9	−1.32%
		Months 11–15	88.7	89.1	86.8	80.3	−9.47%
		Overall	85.8	88.6	88.2	84.6	−1.48%
Treatment session 3	Cohort 1 (n = 1669)	Months 1–5	46.7	42.3	30.6	16.0	−65.74%
		Months 6–10	50.8	42.2	26.9	11.8	−76.71%
		Months 11–15	54.9	42.0	23.6	8.6	−84.26%
		Overall	50.8	42.2	27.0	12.2	−76.07%
	Cohort2 (n = 3268)	Months 1–5	75.0	78.9	76.9	68.1	−9.21%
		Months 6–10	78.0	78.8	73.6	60.1	−22.95%
		Months 11–15	80.7	78.7	70.0	51.5	−36.18%
		Overall	77.9	78.8	73.5	59.9	−23.11%
Treatment Session 4	Cohort 1 (n = 1669)	Months 1–5	34.2	22.3	8.7	1.9	−94.45%
		Months 6–10	36.3	22.4	8.1	1.6	−95.57%
		Months 11–15	38.6	22.6	7.5	1.4	−96.47%
		Overall	36.4	22.4	8.1	1.6	−95.54%
	Cohort2 (n = 3268)	Months 1–5	66.1	70.7	64.3	44.9	−32.02%
		Months 6–10	68.2	70.9	62.5	40.8	−40.15%
		Months 11–15	70.2	71.0	60.6	36.8	−47.56%
		Overall	68.2	70.9	62.5	40.8	−40.07%

[a] Estimated percentages calculated from fitted results of multivariate models.

Table 4
Mixed-effects logistic regression models for retention in treatment sessions 2, 3, and 4 (n = 4937).

Retention in care	Parameter	β	Standard error	*Z*-statistic	*p*-value
Treatment session 2	Intercept	0.440	0.191	2.310	0.021
	Month (linear)	0.049	0.014	3.500	<0.001
	Wait time (linear)	0.014	0.024	0.557	0.577
	Wait time (quadratic)	−0.001	0.001	−1.404	0.160
	Cohort				
	Cohort 1 (PATH1/STAR)[a]	–	–	–	–
	Cohort 2 (PATH2)	0.987	0.174	5.660	<0.001
	Wait time*month	−0.004	0.001	−3.232	0.001
	Wait time*cohort	0.053	0.018	3.022	0.003
Treatment session 3	Intercept	−0.234	0.198	−1.183	0.237
	Month (linear)	0.033	0.014	2.355	0.019
	Wait time (linear)	0.009	0.025	0.373	0.709
	Wait time (quadratic)	−0.002	0.001	−1.726	0.084
	Cohort				
	Cohort 1 (PATH1/STAR)[a]	–	–	–	–
	Cohort 2 (PATH2)	1.233	0.201	6.142	<0.001
	Wait time*month	−0.003	0.001	−3.132	0.002
	Wait time*cohort	0.040	0.020	1.967	0.049
Treatment session 4	Intercept	−0.714	0.215	−3.328	<0.001
	Month (linear)	0.019	0.016	1.171	0.242
	Wait time (linear)	−0.029	0.026	−1.090	0.276
	Wait time (quadratic)	−0.003	0.001	−1.983	0.047
	Cohort				
	Cohort 1 (PATH1/STAR) [a]	–	–	–	–
	Cohort 2 (PATH2)	1.323	0.206	6.412	<0.001
	Wait time*month	−0.002	0.001	−1.507	0.132
	Wait time*cohort	0.081	0.024	3.330	0.001

[a] Reference category.

Please cite this article as: Hoffman, K.A., et al., Days to treatment and early retention among patients in treatment for alcohol drug disorders, *Addictive Behaviors* (2011), doi:10.1016/j.addbeh.2011.01.031

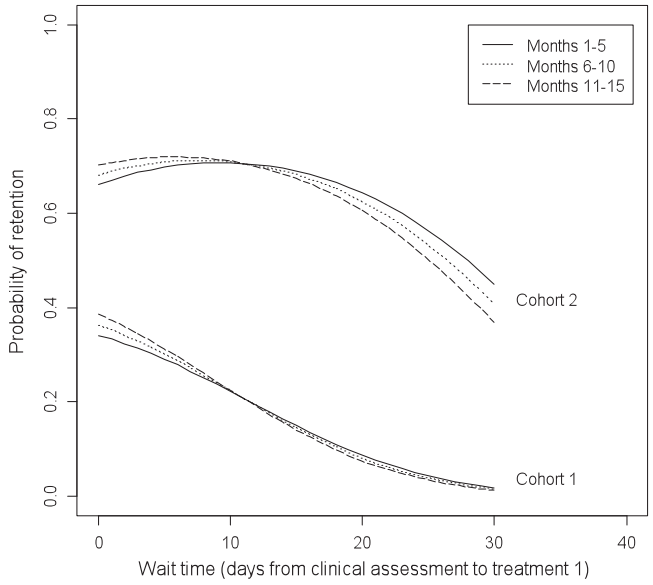

Fig. 1. Estimated probability of retention in care at treatment session 4 by three 5-month intervals, wait time and cohort.

health departments license and fund many of these services (McBride et al., in press). Public health agencies have an opportunity to reduce the societal burden of alcohol and drug disorders by promoting rapid treatment entry. Delays in treatment entry are associated with reduced retention in care, continued alcohol and drug use, and increased risks for negative public health and public safety consequences.

Role of funding sources

Funding for this study was provided by the Robert Wood Johnson Foundation, SAMHSA, and the National Institute on Drug Abuse (R01 DA018282).

Contributors

Example: Authors Hoffman, Ford and McCarty designed the study and wrote the protocol. Authors Hoffman and Ford conducted literature searches and provided summaries of previous research studies. Authors Tillotson and Choi conducted the statistical analysis. Author Hoffman wrote the first draft of the manuscript and all authors contributed to and have approved the final manuscript.

Conflict of interest

All authors declare that they have no conflicts of interest.

Acknowledgments

Grants from the Robert Wood Johnson Foundation and cooperative agreements from the Substance Abuse and Mental Health Services Administration, Center for Substance Abuse Treatment supported the treatment programs participating in the Network for the Improvement of Addiction Treatment. The National Evaluation Team at Oregon Health and Science University and the National Program Office at the University of Wisconsin–Madison were supported through awards from the Robert Wood John Foundation, the Center for Substance Abuse Treatment (through subcontracts from Northrop Grumman Corp) and the National Institute on Drug Abuse (R01 DA018282).

This publication was made possible with support from the Oregon Clinical and Translational Research Institute (OCTRI), grant number UL1 RR024140 from the National Center for Research Resources (NCRR), a component of the National Institutes of Health (NIH), and NIH Roadmap for Medical Research.

References

Addenbrooke, W. M., & Rathod, N. H. (1990). Relationship between waiting time and retention in treatment amongst substance abusers. *Drug and Alcohol Dependence*, *26*(3), 255−264.

Alterman, A. I., Bedrick, J., Howden, D., & Maany, I. (1994). Reducing waiting time for substance abuse treatment does not reduce attrition. *Journal of Substance Abuse*, *6*(3), 325−332.

Appel, P. W., Ellison, A. A., Jansky, H. K., & Oldak, R. (2004). Barriers to enrollment in drug abuse treatment and suggestions for reducing them: Opinions of drug injecting street outreach clients and other system stakeholders. *The American Journal of Drug and Alcohol Abuse*, *30*(1), 129−153.

Benjamin-Bauman, J., Reiss, M. L., & Bailey, J. S. (1984). Increasing appointment keeping by reducing the call-appointment interval. *Journal of Applied Behavior Analysis*, *17*(3), 295−301.

Capoccia, V. A., Cotter, F., Gustafson, D. H., Cassidy, E. F., Ford, J. H., II, Madden, L., et al. (2007). Making "stone soup": Improvements in clinic access and retention in addiction treatment. *Joint Commission Journal on Quality and Patient Safety*, *33*(2), 95−103.

Carr, C. J. A., Xu, J., Redko, C., Lane, D. T., Rapp, R. C., Goris, J., et al. (2008). Individual and system influences on waiting time for substance abuse treatment. *Journal of Substance Abuse Treatment*, *34*(2), 192−201.

Claus, R. E., & Kindleberger, L. R. (2002). Engaging substance abusers after centralized assessment: Predictors of treatment entry and dropout. *Journal of Psychoactive Drugs*, *34*(1), 25−31.

Condelli, W. S. (1994). Domains of variables for understanding and improving retention in therapeutic communities. *Substance Use & Misuse*, *29*(5), 593−607.

Ettner, S. L., Huang, D., Evans, E., Ash, D. R., Hardy, M., Jourabchi, M., et al. (2006). Benefit-cost in the California treatment outcome project: Does substance abuse treatment "pay for itself"? *Health Services Research*, *41*(1), 192−213.

Farabee, D., Leukefeld, C. G., & Hays, L. (1998). Accessing drug-abuse treatment: Perceptions of out-of-treatment injectors. *Journal of Drug Issues*, *28*(2), 381−394.

Festinger, D. S., Lamb, R. J., Kirby, K. C., & Marlowe, D. B. (1996). The accelerated intake: A method for increasing initial attendance to outpatient cocaine treatment. *Journal of Applied Behavior Analysis*, *29*(3), 387−389.

Festinger, D. S., Lamb, R. J., Kountz, M. R., Kirby, K. C., & Marlowe, D. B. (1995). Pretreatment dropout as a function of treatment delay and client variables. *Addictive Behaviors*, *20*(1), 111−115.

Festinger, D. S., Lamb, R. J., Marlowe, D. B., & Kirby, K. C. (2002). From telephone to office: Intake attendance as a function of appointment delay. *Addictive Behaviors*, *27*(1), 131−137.

Fleming, B., & Lewis, S. A. (1987). Factors associated with compliance in the follow-up treatment of alcoholism. *Alcohol and Alcoholism*, *22*(3), 297−300.

Gallant, D. M., Bishop, M. P., Stoy, B., Faulkner, M. A., & Paternostro, L. (1966). The value of a first contact: Group intake session in an alcoholism outpatient clinic: Statistical confirmation. *Psychosomatics*, *7*(6), 349−352.

Gallucci, G., Swartz, W., & Hackerman, F. (2005). Impact of the wait for an initial appointment on the rate of kept appointments at a mental health center. *Psychiatric Services*, *56*(3), 344−346.

Hoffman, K. A., Ford, J. H. II, Choi, D., Gustafson, D. H., & McCarty, D. (2008). Replication and Sustainability of Improved Access and Retention within the Network for the Improvement of Addiction Treatment. *Drug and Alcohol Dependence*, *98*(1-2), 63−69.

Hser, Y., Maglione, M., Polinsky, M. L., & Anglin, M. D. (1998). Predicting drug treatment entry among treatment-seeking individuals. *Journal of Substance Abuse Treatment*, *15*(3), 213−220.

Institute of Medicine (2001). *Crossing the quality chasm: A new health system for the 21st century*. Washington, D.C.: National Academy Press.

Leigh, G., Ogborne, A. C., & Cleland, P. (1984). Factors associated with patient dropout from an outpatient alcoholism treatment service. *Journal of Studies on Alcohol and Drugs*, *45*(4), 359−362.

McBride, D. C., Terry-McElrath, Y. M., VanderWaal, C. J., Chriqui, J. F., & Myllyluoma, J. (in press). United States public health agency involvement in youth-focused illicit drug policy, planning, and prevention at the local level, 1993-2003. *American Journal of Public Health.*

McCarty, D., Gustafson, D. H., Wisdom, J. P., Ford, J., Dongseok, C., & Molfenter, T. (2007). The Network for the Improvement of Addiction Treatment (NIATx): Enhancing access and retention. *Drug and Alcohol Dependence*, *88*(2–3), 138−145.

McCulloch, C. E., Searle, S. R., & Neuhaus, J. M. (2008). *Generalized linear mixed models* (2nd ed.). New Jersey: Wiley & Sons, Inc..

Miller, W. R. (1985). Motivation for treatment: A review with special emphasis on alcoholism. *Psychological Bulletin*, *98*(1), 84−107.

Orme, D. R., & Boswell, D. (1991). The pre-intake drop-out at a community mental health center. *Community Mental Health Journal*, *27*(5), 375.

Palepu, A., Tyndall, M. W., Leon, H., Muller, J., O'Shaughnessy, M. V., Schechter, M. T., et al. (2001). Hospital utilization and costs in a cohort of injection drug users. *CMAJ: Canadian Medical Association Journal*, *165*(4), 415.

R Development Core Team. (2008). R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing, Vienna, Austria.

Rees, D. W., Beech, H. R., & Hore, B. D. (1984). Some factors associated with compliance in the treatment of alcoholism. *Alcohol and Alcoholism*, *19*(4), 303−307.

SAS Institute Inc. (2008). SAS/STAT® software, Version 9.2 for Windows. Cary, NC.

Stark, M. J., Campbell, B. K., & Brinkerhoff, C. V. (1990). "Hello, may we help you?" A study of attrition prevention at the time of the first phone contact with substance-abusing clients. *The American Journal of Drug and Alcohol Abuse*, *16*(1–2), 67−76.

Stasiewick, P. R., & Stalker, R. (1999). A comparison of three interventions on pretreatment dropout rates in an outpatient substance abuse clinic. *Addictive Behaviors*, *24*(4), 579−582.

Thom, B., Brown, C., Drummond, C., Edwards, G., Mullan, M., & Taylor, C. (1992). Engaging patients with alcohol problems in treatment: The first consultation. *British Journal of Addiction*, *87*(4), 601−611.

Woody, G., O'Hare, K., Mintz, J., & O'Brien, C. (1975). Rapid intake: A method for increasing retention rate of heroin addicts seeking methadone treatment. *Comprehensive Psychiatry*, *16*(2), 165−169.