ORIGINAL ARTICLE

Impact of Work Therapy on Health Status Among Homeless, Substance-Dependent Veterans

A Randomized Controlled Trial

T. Michael Kashner, PhD, JD; Robert Rosenheck, MD; Anthony Brian Campinell, MEd; Alina Surís, PhD; and the CWT Study Team (Randy Crandall, MS; Nancy J. Garfield, PhD; Paul Lapuc, PhD; Karen Pyrcz, MS; Thomas Soyka, MS; Annie Wicker, BS)

Background: Little is known about the health outcomes of clinician-supervised, performance-based, abstinence-contingent therapeutic work programs on homeless persons with addiction disorders. This study examined the effect of the Department of Veterans Affairs compensated work therapy program (CWT) on nonvocational outcomes. With mandatory urine screenings and adherence to addiction treatment schedules, CWT provided work opportunities (wages, hours, and responsibilities) with jobs created from Veterans Affairs contracts competitively obtained from private industry.

Methods: Homeless, substance-dependent veterans (N=142) from 4 Department of Veterans Affairs medical centers were randomized, assessed at baseline, and reassessed at 3-month intervals for 1 year. Both CWT and control groups had access to comprehensive rehabilitation, addictions, psychiatric, and medical services. Data were analyzed to determine an immediate CWT effect after treatment and rates of change during 1 year.

Results: Compared with control subjects, patients in the CWT program were more likely to (1) initiate outpatient addictions treatment, (2) experience fewer drug and alcohol problems, (3) report fewer physical symptoms related to substance use, (4) avoid further loss of physical functioning, and (5) have fewer episodes of homelessness and incarceration. No effect on psychiatric outcomes was found.

Conclusion: Work therapy can enhance nonvocational outcomes of addiction treatment for homeless persons, although long-term gains remain unknown.

Arch Gen Psychiatry. 2002;59:938-944

From the Department of Veterans Affairs Medical Centers at Dallas, Tex (Drs Kashner and Surís and Ms Wicker), West Haven, Conn (Dr Rosenheck), Bedford, Mass (Mr Campinell and Ms Pyrcz), St Cloud, Minn (Mr Soyka), Topeka, Kan (Mr Crandall and Dr Garfield), and Northampton, Mass (Dr Lapuc); the Department of Psychiatry, The University of Texas Southwestern Medical Center at Dallas (Drs Kashner and Surís and Ms Wicker); and the Department of Psychiatry, Yale University (Dr Rosenheck).

MENTAL HEALTH professionals often refer clients to clinical programs where the primary goal is competitive employment. These programs of vocational rehabilitation, sheltered workshops, job clubs, and transitional and supported employment have shown varying degrees of success in helping the mentally ill attain employment.[1-5] However, the relationship between structured work and nonvocational health outcomes remains inconclusive.

In contrast, economists consider productive work as an outcome of a healthy labor force.[6] Epidemiologists emphasize work-related illnesses,[7] hazards,[8,9] stresses,[10,11] and adverse health behaviors.[12] Public health research finds retirement often leading to poorer physical functioning,[13-15] somatic complaints,[16] and fatal heart attacks,[17] although it is unclear whether retirement resulted in or from poor health. What is not known is whether structured work can change health behaviors and, thus, health status.

The current study focuses on the Department of Veterans Affairs (VA) compensated work therapy (CWT) program, a clinician-supervised, abstinence-contingent, performance-based work program for homeless persons. The CWT program offers pay rewards but requires random drug testing and adherence to a schedule of outpatient addiction services determined to be clinically appropriate for each client. The program's clinical setting ensures that the link between work performance (productivity and presentation) and health behaviors (sobriety and use of addiction services) to job rewards (wages, hours, and responsibilities) are not undermined by the vicissitudes of labor markets. The study focused on homeless persons who lack regular employment and structured environments. Study outcomes included substance dependence behaviors (substance consumption and use of addictions treatment services), health outcomes (addiction-related physical symptoms, psychiatric symptoms, and health functioning), and other aspects of quality of life (rates of incarceration and

homelessness). The study was set at VA medical centers where all clients had access to comprehensive health services, including addictions treatment and vocational rehabilitation. Access to care did not depend on employment status.

SUBJECTS AND METHODS

SUBJECT SELECTION

Subjects were recruited from homeless centers and addiction units at 4 VA medical centers located in Bedford, Mass; Northampton, Mass; Topeka, Kan; and St Cloud, Minn. Qualifying subjects (1) were eligible for VA care, (2) were homeless at intake, (3) satisfied *DSM-III-R* criteria for substance dependence or abuse,[18] and (4) were willing to enter a therapeutic work program. For this study, homeless persons have "a primary nighttime residence that is a supervised publicly or privately operated shelter designed to provide temporary living accommodations, an institution that provides a temporary residence for individuals intended to be institutionalized, or a public or private place not designed for, or ordinarily used as, a regular sleeping accommodation for human beings" (McKinney Act, 42 USC 11302). Excluded patients were those (1) institutionalized at intake, (2) mentally or physically unable to work in the opinion of the CWT admitting clinician, (3) diagnosed with a terminal illness, (4) planning to leave the study service area within 1 year, or (5) unresponsive at the intake interview.

INTERVENTION

First introduced in 1957 (38 USC 1718), the VA CWT programs[19] teach work discipline with abstinent-contingent, performance-based work for pay in staff-supervised, structured settings. As administered at the 4 study sites between July 1, 1994, and March 31, 1997, CWT offered work opportunities (continued employment, higher wages, hours, promotion, and responsibility) based on client work performance (productivity, reliability, presentation, and punctuality) and health behavior (sobriety and use of recommended addiction services) as judged by CWT clinicians through client observation, random drug screenings, and chart reviews. The CWT combined elements of supported employment (nontrivial wages paid from revenues earned from private sector contracts) and stepwise programs (clinician supervision and VA workshops). Consequences for inappropriate behaviors (positive drug screenings) varied from a reprimand to program dismissal and loss of CWT employment. Unfettered by informal organizations, appellate bureaucracies, and labor regulations, clinician managers were free to protect the integrity of work incentives and make judgments in the client's best interest. Control patients were not enrolled in CWT for at least the 1-year follow-up, although both subjects who received CWT and control subjects had full access to VA comprehensive medical, mental, addictions, and vocational rehabilitation services, including job-seeking skills and support, job documentation and interviewing techniques, and career counseling and assessment.

We hypothesized that the mandatory addiction treatment and drug screening protocols in CWT, among other factors, would have an immediate impact on addiction status as assessed by patient use of drugs and alcohol, and secondarily on patient use of addiction services and prevalence of substance use–related symptoms. We also hypothesized that subjects in the CWT group would gradually experience better psychiatric and medical status during the 1-year follow-up after CWT began.

RANDOMIZATION

Research assistants at each of the 4 study sites admitted patients, checked eligibility, administered baseline questionnaires, and then called a national coordinator (A.W.) in Dallas, Tex, to receive a patient identification number. Once the subject was assigned to a number, the coordinator revealed treatment assignment by opening, in sequence, sealed envelopes that had been addressed to both site and patient identification number. The enclosed assignments were based on random numbers generated by an SPSS program (SPSS Inc, Chicago, Ill). To attract subjects, a sampling ratio of 1 (control) to 4 (subject in CWT) was adopted. Subjects randomized to CWT were offered employment as soon as a CWT-sponsored job became available, usually within 6 days. After the baseline interview, neither patient nor assessors were blinded to study assignments.

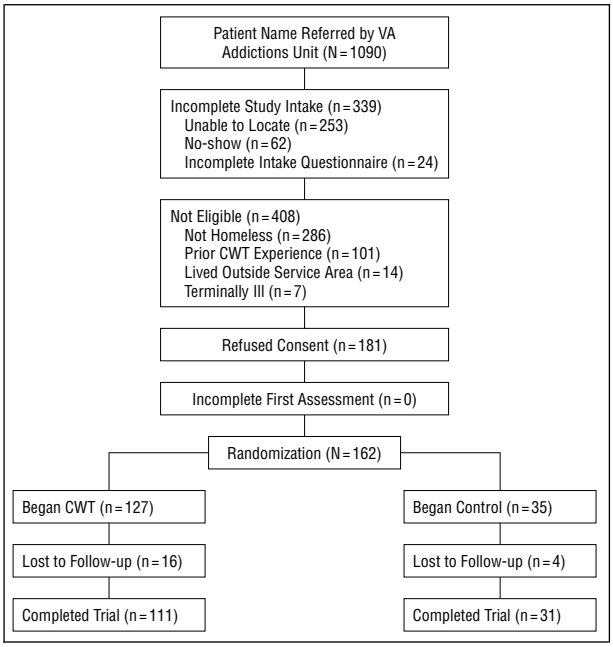
MEASUREMENTS

Data came from face-to-face interviews conducted at baseline and at 3-month intervals for 1 year by trained interviewers under supervision of master's- or doctorate-level prepared social workers and psychologists. Information was verified by VA computerized file extracts and patient chart reviews. To ensure reliability of data collection, interviewers received group training, participated in routine conference calls, and were tested by rating prerecorded taped interviews.

As the primary measure, addiction status was determined by the Addiction Severity Index (ASI),[20-22] summarizing drug and alcohol use problems into composite scores ranging from 0 to 1, with higher scores indicating more problems. Administered under confidential circumstances, these measures have been shown to be valid.[23] As confirmatory measures of outcome, addiction care–seeking behavior was represented by a dichotomous variable that assumed a value of 1 if the patient had obtained at least 1 outpatient addiction visit during a 3-month period before each follow-up interview, and 0 otherwise. Substance use–related physi cal problems were measured as a simple count of 11 symptoms that included the presence or absence of seizures, delirium tremens, or memory trouble; seeing or hearing things not there after cutting down on substance use; liver disease; hepatitis or yellow jaundice; vomited blood or other stomach troubles; tingling or numbness in feet; inflammation of pancreas or pancreatitis; drug overdose; subacute bacterial endocarditis; cellulitis or other infections due to intravenous drug use; and continued use when aware that consumption may exacerbate serious physical illness.

Exploratory outcomes included psychiatric status assessed by a normalized global Brief Symptom Inventory,[24,25] the ASI Psychiatric Status, and the Mental and Social Functioning components of the 36-Item Short Form Health Survey from the Medical Outcomes Study (SF-36).[26,27] Medical status was assessed with the Physical Functioning component of the SF-36 and the Medical Status component of the ASI. Other measures included presence or absence of episodes of criminal justice incarceration and homeless nights during the 3 months before each interview.

The cost of inpatient (outpatient) care was calculated in 3-month intervals by multiplying the number of days (visits) by a cost per day (per visit) and summed over all respective bed sections (clinic stops). Costs were calculated for medicine, psychiatry, and addiction and rehabilitation services. Unit costs were based on median cost (1997 US dollars) for VA medical centers. Data came from VA's cost files that include costs for professional time, supplies, indirect administrative support and building maintenance, and depreciation for equipment and buildings.[28] Separate estimates were calculated for



Patient progress through the trial. VA indicates Veterans Affairs; CWT, compensated work therapy.

medical, psychiatric, and addiction and rehabilitation services.

STATISTICAL ANALYSES

Two-tailed χ^2 (discrete) and t (continuous) tests compared group differences at baseline. Longitudinal outcome data were analyzed by hierarchical regressions with the use of HLM/3L software[29] to compute outcome differences between CWT and control groups as a percentage of baseline scores (continuous measures) and an odds ratio (dichotomous measures).

Tracking homeless patients necessitated the use of parametric statistics to account for missing observations and variable intervals between follow-up interviews, discussed in clinical trials generally[30] and mental health specifically.[31,32] With these approaches, time of observation enters as an explanatory variable to determine whether measured outcomes change with time.[33,34] Clinical programs are evaluated by detecting whether differences between treated and control subjects "grow" over time,[35-37] although estimates are unbiased only to the extent that the occurrence of missing values and length of intervals between follow-ups are uncorrelated with treatment assignment. The approach permits one to adjust for patient use of other services as time-dependent covariates.

Traditional parametric approaches determine treatment effects by detecting whether differences in outcomes between treated and control patients grow with time. These growth strategies may not describe programs that focus on behavior (eg, addictions). Here, program benefits may mature immediately after treatment begins, only to diminish with time because (1) efficacy "wears off," (2) efficacious alternatives help control clients "catch up," (3) the intervention only enhances the speed of recovery, or (4) the intervention postpones inevitable outcomes of an intractable disorder. Thus, we estimated immediate and growth-rate effects by means of a declining-effects model (T.M.K., Thomas J. Carmody, PhD, Trish Suppes, MD, PhD, A. John Rush, MD, M. Lynn Crismon, PharmD, Alexander L. Miller, MD, Marchia Toprac, PhD, and Madhukar Trivedi, MD, unpublished data, August 2001):

$$y_{sit}=\beta_0+\beta_1 I_{si}+\beta_{20} Z_t+\beta_{21} Z_t I_{si}+\beta_{30} t+\beta_{31} t I_{si}+\beta_4 c_{sit}+\alpha_s+u_{si}+v_{sit},$$

where y_{sit} is the outcome assessed for patient i at site s ($s=1, 2, \ldots 4$) at t quarters (3 months) past baseline ($t=0$). To evaluate CWT, the "intent-to-treat" variable I_{si} assigns a value of 1 for patients randomized to CWT and 0 if assigned to the control group. Z_t is a dummy variable that assumes a value of 1 for $t>0$, and 0 otherwise. The variable c_{sit} is use of care during 3 months before t, including psychiatric care (psychiatric status outcomes), medical care (medical outcomes), and addiction and rehabilitation services (addiction status). The use of care covariate was excluded when use of addiction services was the dependent variable. The u_{si} and v_{sit} are random variates representing each patient and each assessment, assumed to be independent and normally distributed with 0 mean and constant variance during the 1-year follow-up.

As with traditional models, the growth-rate effect (β_{31}) describes how outcome differences between CWT and controls grow, or decline, with time. The immediate effect (β_{21}) describes how a lump-sum difference in outcomes between CWT and control subjects may occur initially after active CWT. Thus, outcome difference between CWT and control subjects for $t>0$ equals $\beta_{21}+\beta_{31}t$. Other parameters are the average starting value for control subjects (β_0); difference between CWT and control groups at baseline ($t=0$) (β_1); initial "lump-sum" change in outcomes for control subjects (β_{20}); growth rate in outcomes for control subjects (β_{30}); use of care main effect (β_4); and fixed effects reflecting site-specific differences in average outcomes (α_s), with $\alpha_s = 0$ for $s = 1$, the reference site.

The equation simplifies to a growth model when $\beta_{20}=0$ and $\beta_{21}=0$ and can be modified to a logistic regression for dichotomous outcome variables.

RESULTS

Data collection began July 19, 1994, with recruitment ending March 22, 1996, and follow-up assessments ending April 1, 1997. The **Figure** describes the progress through the trial of the original 1090 subjects who had been discharged from VA addiction programs and whose names were referred for study. The large number of no-shows and patients unable to be located reflects difficulties inherent in studying homeless populations. The final sample (N=142) was evenly distributed among the 4 sites (37%, 22%, 21%, and 20%) and included 22 (15%) who completed 2 follow-ups; 21 (15%), 3 follow-ups; and 99 (70%), 4 follow-ups.

The final sample did not differ from the 201 excluded eligible subjects (181 nonconsenting and 20 lost to follow-up) with respect to demographic characteristics (mean age, 43.1 vs 41.9 years, $t=1.44$, $P<.15$; African American, 26% vs 25%, $t=0.22$, $P<.83$; years of education, 12.7 vs 12.6, $t=0.21$, $P<.84$), cost of VA care during the year before baseline ($26 199 vs $25 133, $t=0.41$, $P<.68$), and health status (ASI for alcohol problems, 0.36 vs 0.36, $t=0.03$, $P<.98$; ASI for drug problems, 0.11 vs 0.12, $t=1.22$, $P<.23$; physical symptoms relating to substance use, 3.52 vs 3.53, $t=0.04$, $P<.97$; ASI psychiatric status, 0.39 vs 0.38, $t=0.25$, $P<.81$; Brief Symptom Inventory global status, 0.002 vs 0.001, $t=0.16$, $P<.87$; SF-36 Mental Functioning, 50.2 vs 50.6, $t=0.16$, $P<.87$; SF-36 Social Functioning, 58.9 vs 57.8, $t=0.30$, $P<.77$; ASI edical Status, 0.35 vs 0.29, $t=1.39$, $P<.17$; and SF-36 Physical Functioning, 85.9 vs 84.2, $t=0.77$, $P<.44$).

Despite a 12% loss to follow-up, **Table 1** shows no statistically significant difference between the CWT

Table 1. Patient Characteristics at Baseline and 1 Year*

	Work Group (n = 111)	Control Subjects (n = 31)	Statistic	P
Age, y			$t = 1.16$	.25
Mean (SD)	42.7 (7.2)	44.4 (7.6)		
Median	42	45		
Range	26-62	31-60		
Education, y			$t = 0.68$	.50
Mean (SD)	12.7 (1.7)	12.5 (1.5)		
Median	12	12		
Range	9-20	10-16		
Ethnicity, No. (%)				
African American	27 (24)	10 (32)		
Hispanic	1 (1)	0		
Native American	2 (2)	0	$\chi^2_3 = 1.52$	.68
Other	81 (73)	21 (68)		
Drug preference, No. (%)				
Crack/cocaine	33 (30)	10 (32)		
Heroin	8 (7)	3 (10)		
Marijuana	8 (7)	2 (6)	$\chi^2_4 = 0.64$	.96
Other	5 (5)	2 (6)		
No preference	57 (51)	14 (45)		
Baseline addiction status, mean				
Outpatient addiction services use rate, %	53.2	45.2	$\chi^2_1 = 0.62$	.43
ASI drug consumption	0.11	0.10	$t = 0.39$	.70
ASI alcohol consumption	0.36	0.35	$t = 0.22$	.83
No. of substance-related physical symptoms	3.4	3.9	$t = 1.10$	.30
Baseline psychiatric status, mean				
Global Brief Symptom Inventory	0.024	0.008	$t = 0.08$	.95
Mini-Mississippi PTSD†	30.4	31.6	$t = 0.75$	.46
SF-36 Mental Functioning	49.4	53.1	$t = 0.73$	.47
SF-36 Social Functioning	59.6	56.5	$t = 0.48$	.63
ASI Psychiatric Symptoms	0.39	0.35	$t = 0.78$	.44
Baseline medical status, mean				
SF-36 Physical Functioning	85.2	88.5	$t = 0.94$	.35
ASI Medical Status	0.36	0.29	$t = 1.04$	.31
Baseline other measures, mean, No. (%)				
Incarceration rate	7 (6.3)	1 (3.2)	$\chi^2_1 = 0.43$	.52
Homeless rate	111 (100.0)	31 (100.0)		
VA utilization 1 y after baseline, mean				
Inpatient days				
Medicine	2.6	0.3	$t = 3.02$	.003
Psychiatry	22.5	19.3	$t = 0.44$	.66
Addictions	11.5	9.4	$t = 0.61$	.54
Outpatient clinic stops, mean				
Medicine	23.8	22.4	$t = 0.26$	.79
Psychiatry	21.3	14.4	$t = 1.36$	.18
Addictions	16.9	9.7	$t = 2.18$	.03
Rehabilitation	9.8	6.0	$t = 1.05$	.30

*ASI indicates Addiction Severity Index; PTSD, posttraumatic stress disorder; SF-36, 36-Item Short Form Health Survey; and VA, Veterans Affairs.

†The Mini-Mississippi for Combat-Related Posttraumatic Stress Disorder (Mini-Mississippi PTSD) is an 11-item version of the original 35-item Mississippi Scale.[38] The items for the Mini-Mississippi PTSD were chosen if they factor loaded at >0.50 on a principal components analysis of the entire scale or if they represented a *DSM-III-R* symptom criterion.[39] The correlation between the full scale and the Mini-Mississippi PTSD was 0.90. Scores ranged from 11 to 55, with higher scores indicating more PTSD symptoms.

(n=111) and control (n=31) groups for demographic characteristics and outcome measures assessed at baseline. During the year after baseline, both CWT and control groups had extensive use of health services, including psychiatric and rehabilitation care, although differences reached statistical significance only in inpatient medicine days and outpatient addiction visits.

Subjects assigned to CWT received a job within a median 6 days after baseline and worked a mean of 393 hours (SD, 474 hours) at an average wage of $4.04/h (SD, $1.80/h; range, $0.50/h to $10.75/h). Of hours worked, 58% were unskilled, 22% semiskilled, 16% skilled labor, and 4% clerical, sales, or technical related. Working subjects were screened for substance use an average 8.6 times (SD, 10.7), or approximately once every 20 work days. Among those tested, 44% had at least 1 positive screening, with 15% of screenings testing positive.

Utilization covariates (measured in dollars) were significant predictors of patient outcomes for ASI drug ($\beta_4=0.003$, $t_{393}=2.25$, $P<.02$) and alcohol ($\beta_4=0.008$, $t_{393}=2.31$, $P<.02$) use problems, psychiatric status ($\beta_4=0.011$, $t_{393}=2.18$, $P<.03$), number of substance use–

Table 2. Adjusted CWT Immediate and Growth-Rate Effects, by Outcome*

	Immediate Effect				Growth-Rate Effect			
	β_{21}†	β_{21}	*t* (*df* = 393)	*P*	β_{31}†	β_{31}	*t* (*df* = 393)	*P*
Addiction status								
Outpatient addiction services (odds)	2.7 (1.4 to 5.4)	2.72 (1.36 to 5.42)	2.84	.005	NS	0.76 (0.50 to 1.15)	1.29	.20
ASI drug consumption	−44.7% (−69.7% to −19.7%)	−0.05 (−0.08 to −0.02)	3.51	.001	NS	0.01 (−0.01 to 0.03)	0.93	.35
ASI alcohol consumption	−45.4% (−64.0% to −26.9%)	−0.16 (−0.23 to −0.10)	4.81	.001	NS	0.04 (−0.003 to 0.08)	1.83	.07
Substance-related physical symptoms	−64.4% (−80.0% to −48.8%)	−2.19 (−2.72 to −1.66)	8.11	.001	17.0% (6.9% to 26.9%)	0.58 (0.24 to 0.91)	3.32	.001
Psychiatric status								
Global Brief Symptom Inventory	NS	0.02 (−0.18 to 0.23)	0.22	.83	NS	−0.09 (−0.22 to 0.05)	1.26	.21
ASI Psychiatric Symptoms	NS	−0.02 (−0.07 to 0.04)	0.61	.54	NS	−0.03 (−0.06 to 0.01)	1.63	.11
SF-36 Mental Functioning	NS	1.19 (−4.80 to 7.17)	0.39	.70	NS	2.18 (−1.71 to 6.06)	1.10	.27
SF-36 Social Functioning	NS	−2.55 (−10.90 to 5.80)	0.60	.55	NS	3.64 (−1.74 to 9.03)	1.33	.19
Medical status								
SF-36 Physical Functioning	−6.8% (−12.9% to −0.7%)	−5.80 (−10.95 to −0.65)	2.21	.03	6.9% (2.9% to 10.8%)	5.83 (2.43 to 9.23)	3.36	.001
ASI Medical Status	NS	−0.04 (−0.14 to 0.05)	0.95	.35	−24.4% (−41.5% to −7.4%)	−0.09 (−0.15 to −0.03)	2.82	.005
Other measures								
Incarceration (odds)	0.3 (0.1 to 0.8)	0.29 (0.11 to 0.77)	2.47	.01	NS	1.23 (0.77 to 1.96)	0.87	.39
Homelessness (odds)	0.1 (0.1 to 0.3)	0.12 (0.06 to 0.25)	5.61	.001	NS	1.59 (0.97 to 2.61)	1.83	.07

*Adjusted for use (in dollars) during the previous quarter of addiction services (addiction status outcomes), psychiatric services (psychiatric status outcomes), and medical care for medical status outcomes. Favorable outcomes include more addiction visits, higher functioning (SF-36), fewer symptoms (ASI, substance-related physical symptoms, Brief Symptoms Inventory), and fewer episodes of incarceration or homelessness. CWT indicates compensated work therapy; NS, not significant; ASI, Addiction Severity Index; and SF-36, 36-Item Short Form Health Survey. The 95% confidence intervals are given in parentheses.

†CWT minus control differences are reported for continuous measures as a percentage of baseline values averaged over all subjects.

related physical symptoms (β_4=0.18, t_{393}=3.85, P<.001), and SF-36 Mental Functioning (β_4=−1.07, t_{393}=1.97, P<.049) and Social Functioning (β_4=−1.88, t_{393}=2.53, P<.01).

The CWT immediate and growth-rate effects are presented in **Table 2** for each of the 12 outcome measures as a percentage of average baseline scores (continuous) or as odds ratios (dichotomous). Consistent with expectations, CWT clients were initially 2.7 times more likely to use addiction treatment than their control counterparts. After adjustment for greater use of addiction treatment with ±SE, patients who received CWT experienced immediate reductions in drug (−44.7%±12.8%) and alcohol (−45.4%±9.4%) use problems, and the number of substance use–related physical symptoms (−64.4%±8.0%). These immediate differences tended to decline with time, although such a "catch-up" pattern was statistically significant for only the number of substance use–related physical symptoms. Here, group differences declined by 17.0%±5.1% per quarter as control subjects, unlike their CWT counterparts, experienced a reduction in symptoms during follow-up by an average of −19.2%±4.4% per quarter.

There were no significant difference in psychiatric status between the CWT and control groups on any of the 4 outcome measures. On the other hand, differences between CWT and control groups tended to grow during follow-up by −24.4%±8.7% per quarter on the basis of ASI Medical Status and 6.9%±2.0% per quarter on the basis of SF-36 Physical Functioning. However, these gains were due primarily to declining function among control subjects (ASI Medical Status, 23.9%±7.6% per quarter; SF-36 Physical Functioning, −6.2%±1.8% per quarter) rather than from improved functioning among subjects in the CWT group (ASI Medical Status, −0.4%±11.5% per quarter; SF-36 Physical Functioning, 0.6%±2.7% per quarter). Finally, patients in the CWT group were initially 30% and 10% as likely to report an episode of incarceration and homelessness, respectively, as their control counterparts.

COMMENT

In this randomized, controlled trial, we evaluated a clinician-supervised, performance-based work program that tied paid work opportunities (hours, wages, and responsibilities) to performance (productivity, punctuality, and reliability) and health behaviors (sobriety and use of addiction services). Among homeless, substance-dependent persons with expressed desires to work, CWT was associated with greater use of addiction services. Even after adjustment for use of health and rehabilitative ser-

vices, these data suggest that CWT clients experienced fewer problems associated with substance use and fewer episodes of homelessness and incarceration. The CWT clients also did not report the same decline in medical status and physical functioning exhibited by control subjects. However, no work effect on psychiatric status was detected. These differences are remarkable given that both groups had extensive use of medical, psychiatric, addictions, and rehabilitation services from local VA medical centers. However, patients in the CWT group reported generally more inpatient days and outpatient visits, suggesting that these outcomes may come at the price of higher health care costs.

These findings are consistent with those of the Milby et al study[40] of substance-abusing homeless persons, in which abstinent contingent work therapy was found to be associated with 36% fewer positive cocaine toxicologic tests within 2 months of beginning treatment. These results are also consistent with the findings of Bell et al[41,42] that paid vs unpaid work at VA medical facilities was associated with symptom reductions for patients with schizophrenia or schizoaffective disorders, and with Rosenheck and Seibyl's[43] observational study that showed that receiving care at a residential support facility offering therapeutic work, but requiring responsible behavior, was associated with substance abuse, but not psychiatric symptoms. These results contrast with findings from assertive community treatment programs for homeless substance abusers that failed to find high rates of abstinence,[44] and from supported employment in competitive work environments that failed to find symptom reductions.[33,45] However, these latter studies focused on severe mental illness.

It is unknown which CWT elements may have contributed to program outcomes: structured work, pay incentives for mandatory substance screenings and adherence to addiction treatment schedules, clinician supervision, and improved access to care. Comparing other studies, Ames and Janes[46] found that boring, stressful, and isolating work can in fact contribute to substance use behaviors, while alcoholic subjects who returned to work were likely to remain sober, but only when the job discouraged drinking behaviors and offered structured supervision.[47,48] A recent econometric analysis (2-stage least-squares adjusting for self-selection) of national survey data (1991 and 1993 National Health Interview Surveys) suggested that workplace bans were associated with a 5–percentage point reduction in smoking prevalence and a 10% reduction in daily consumption among smokers, and accounted for all of the explained variance in smoking reduction among workers relative to nonworkers.[49] Additional study is needed to untangle how program elements contribute to outcomes. With the success of supported employment programs, however, future studies should consider how outcomes vary between clinical and competitive employment settings.

There are study limitations. Findings were limited to a VA setting, 142 subjects, 1 year of follow-up, a low consent rate (47%), and a 1:4 sampling ratio that further limited statistical power. Outcomes measures were based on patient self-reports, although between-group biases may be small. First, CWT drug screenings averaged once every 20 days, so that hiding information from independent research teams may have had little perceived consequence on work opportunities. Second, control subjects wanting to enter CWT after completing the study had incentives to also underreport symptoms. Third, reduced substance consumption was consistent with patterns observed for other outcomes, including use of addiction services, substance use–related symptoms, medical status, and other measures.

Biases associated with nonrandomly occurring missing data and variable intervals between repeated measures may also be small. Compared with control subjects, CWT clients had a comparable number of observations (3.6 vs 3.8; $t=1.44$, $P<.15$) and time between observations (1.5 vs 1.4 quarters; $t=1.26$, $P<.21$). Regression to the mean bias either works against study findings (symptom counts) or is small compared with estimated effect size (drug and alcohol use problems).

In summary, the VA's CWT program was associated with better addiction status and with fewer episodes of homelessness and incarceration, and appears to prevent further deterioration in medical status and physical functioning. More research is needed to assess long-term impacts and to determine the active program ingredients contributing to outcomes.

Submitted for publication December 3, 1999; final revision received December 14, 2001; accepted December 20, 2001.

This study was supported in part by the Department of Veterans Affairs, Health Services Research and Development Service grant IIR 92-043 and Research Career Scientist Award 92-403, Washington, DC, and by grant 5-R24-MH53799 from the National Institute of Mental Health, Bethesda, Md.

We thank Mary Kashner, Pauline Salyer, Perry Lambird, MD, Mona Sue Lambird, JD, George Moore, Robert D. Fowler, MD, Stephen Berman, MSW, and A. John Rush, MD, for their special contributions in advancing this study.

The opinions expressed herein are those of the authors and do not necessarily reflect the views of supporting agencies and sponsors.

Corresponding author and reprints: T. Michael Kashner, PhD, JD, Department of Psychiatry, The University of Texas Southwestern Medical Center at Dallas, 5323 Harry Hines Blvd, Dallas, TX 75390-9086.

REFERENCES

1. Macias C, Barreira P, Alden M, Boyd J. The ICCD benchmarks for clubhouses: a practical approach to quality improvement in psychiatric rehabilitation. *Psychiatr Serv.* 2001;52:207-213.
2. Bond GR, Boyer SL. Rehabilitation programs and outcomes. In: Ciardello JA, Bell MD, eds. *Vocational Rehabilitation of Persons With Prolonged Psychiatric Disorders.* Baltimore, Md: Johns Hopkins University Press; 1988:231-263.
3. Bond GR, Drake RE, Mueser KT, Becker DR. An update on supported employment for people with severe mental illness. *Psychiatr Serv.* 1997;48:335-346.
4. Crowther RE, Marshall M, Bond GR, Huxley P. Helping people with severe mental illness to obtain work: systematic review. *BMJ.* 2001;322:204-208.
5. Bond GR, Becker DR, Drake RE, Rapp CA, Meisler N, Lehman AF, Bell MD, Blyler CR. Implementing supported employment as an evidence-based practice. *Psychiatr Serv.* 2001;52:313-322.
6. Strauss J, Duncan T. Health, nutrition, and economic development. *J Econ Literature.* 1998;36:766-817.
7. Newman LS. Occupational illness. *N Engl J Med.* 1995;333:1128-1134.

8. Crawford JO, Bolas SM. Sick building syndrome, work factors and occupational stress. *Scand J Work Environ Health*. 1996;22:243-250.
9. Snashall D. ABC of work related disorders: hazards of work. *BMJ*. 1996;313: 223-226.
10. Levi L, Frankenhaeuser M, Gardell B. Report on work stress related to social structures and processes. In: Elliott GR, Eisdorfer C, eds. *Stress and Human Health*. New York, NY: Springer Publishing; 1982:119-146.
11. Kasl SV. The influence of the work environment on cardiovascular health: a historical, conceptual, and methodological perspective. *J Occup Health Psychol*. 1996; 1:42-56.
12. Hellerstedt WL, Jeffery RW. The association of job strain and health behaviours in men and women. *Int J Epidemiol*. 1997;26:575-583.
13. Ekerdt DJ, Baden L, Bosse R, Dibbs E. The effect of retirement on physical health. *Am J Public Health*. 1983;73:779-783.
14. Burkhauser RV, Quinn JF. Is mandatory retirement overrated? evidence from the 1970s. *J Hum Resources*. 1983;18:337-358.
15. Wolfe JR. A model of declining health and retirement. *J Polit Econ*. 1985;93: 1258-1267.
16. Ekerdt DJ, Bosse R, Goldie C. The effect of retirement on somatic complaints. *J Psychosom Res*. 1983;27:61-67.
17. Gonzalez ER. Retiring may predispose to fatal heart attack. *JAMA*. 1980;243:13-14.
18. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders, Revised Third Edition*. Washington, DC: American Psychiatric Association; 1987.
19. Department of Veterans Affairs. *Veterans Health Administration Handbook #1103.1*. Washington, DC: Department of Veterans Affairs; March 1996.
20. McLellan AT, Lubrosky L, O'Brien CP. An improved evaluation instrument for substance abuse patients: the Addiction Severity Index. *J Nerv Ment Dis*. 1980;168: 26-33.
21. McLellan AT, Lubrosky L, Woody GE, O'Brien CP, Druley KA. Predicting response to alcohol and drug abuse treatment: role of psychiatry severity. *Arch Gen Psychiatry*. 1983;40:620-625.
22. McLellan AT, Woody GE, Lubrosky L, O'Brien CP, Druley KA. Increased effectiveness of substance abuse treatment: a prospective study of patient-treatment "matching." *J Nerv Ment Dis*. 1983;171:597-605.
23. McLellan AT, Lubrosky L, Cacciola MA, Griffith J, Evans F, Barr H, O'Brien CP. New data from the Addiction Severity Index: reliability and validity in three centers. *J Nerv Ment Dis*. 1985;173:412-423.
24. Derogatis LR, Spencer PM. *Brief Symptom Inventory: Administration, Scoring, and Procedures Manual*. Baltimore, Md: Clinical Psychometric Research; 1982.
25. Derogatis LR. *BSI: Brief Symptom Inventory: Administration, Scoring, and Procedures Manual*. Minneapolis, Minn: National Computer Systems Inc; 1993.
26. Tarlov AR, Ware JE Jr, Greenfield S, Nelson EC, Perrin E, Zubkoff M. The Medical Outcomes Study: an application of methods for monitoring the results of medical care. *JAMA*. 1989;262:925-930.
27. Ware JE, Snow KK, Kosinski M, Gandek B. *SF-36 Health Survey Manual and Interpretation Guide*. Boston, Mass: Health Institute, New England Medical Center; 1993.
28. Menke TJ, Homan RH, Kashner TM. Determining costs in VA: research design problems and solutions illustrated with case studies. *Med Care*. 1999;37(suppl VA):AS18-AS26.
29. Raudenbush SW, Bryk AS, Cheong YF, Congdon RT Jr. *HLM5: Hierarchical Linear and Nonlinear Modeling*. Lincolnwood, Ill: Scientific Software International Inc; 2000.
30. Siegel JE, Laska E, Meisner M. Statistical methods for cost-effectiveness analyses. *Control Clin Trials*. 1996;17:387-404.
31. Wells KB, Sturm R, Sherbourne CD, Meredith LS. *Caring for Depression: A Rand Study*. Cambridge, Mass: Harvard University Press; 1996.
32. Hargreaves WA, Shumway M, Hu T-W, Cuffel B. *Cost Outcome Methods for Mental Health*. San Diego, Calif: Academic Press; 1998.
33. Drake RE, McHugo GJ, Bebout RR, Becker DR, Harris M, Bond RG, Quimby E. A randomized clinical trial of supported employment for inner-city patients with severe mental disorders. *Arch Gen Psychiatry*. 1999;56:627-633.
34. Gibbons RD, Hedeker D, Elkin I, Waternaux C, Kraemer HC, Greenhouse JB, Shea T, Imber SD, Sotsky SM, Watkins JT. Some conceptual and statistical issues in analysis of longitudinal psychiatric data: application to the NIMH Treatment of Depression Collaborative Research Program Dataset. *Arch Gen Psychiatry*. 1993; 50:739-750.
35. Bryk AS, Raudenbush SW. *Hierarchical Linear Models*. Newbury Park, Calif: Sage Publications; 1992.
36. Stanek EJ III, Diehl SR. Growth curve models of repeated binary response. *Biometrics*. 1988;44:973-983.
37. Willett JB, Ayoub CC, Robinson D. Using growth modeling to examine systematic differences in growth: an example of change in the functioning of families at risk of maladaptive parenting, child abuse, or neglect. *J Consult Clin Psychol*. 1991;59:38-47.
38. Keane TM, Caddell JM, Taylor KL. Mississippi Scale for Combat-Related Posttraumatic Stress Disorder: three studies in reliability and validity. *J Consult Clin Psychol*. 1099;56:85-90.
39. Wolfe J, Keane TM, Kaloupek DG, Mora CA, Wine P. Patterns of positive readjustment in Vietnam combat veterans. *J Trauma Stress*. 1993;6:179-193.
40. Milby JB, Schumacher JE, Raczynski JM, Caldwell E, Engle M, Michael M, Carr J. Sufficient conditions for effective treatment of substance abusing homeless persons. *Drug Alcohol Depend*. 1996;43:39-47.
41. Bell MD, Lysaker PH, Milstein RM. Clinical benefits of paid work activity in schizophrenia. *Schizophr Bull*. 1996;22:51-67.
42. Bell MD, Lysaker PH. Clinical benefits of paid work activity in schizophrenia: 1-year follow-up. *Schizophr Bull*. 1997;23:317-328.
43. Rosenheck R, Seibyl CL. Effectiveness of treatment elements in a residential–work therapy program for veterans with severe substance abuse. *Psychiatr Serv*. 1997;48:928-935.
44. Meisler N, Blankertz L, Santos AB, McKay C. Impact of assertive community treatment on homeless persons with co-occurring severe psychiatric and substance use disorders. *Community Ment Health J*. 1997;133:113-122.
45. Drake RE, McHugo GJ, Becker DR, Anthony WA, Clark RE. The New Hampshire study of supported employment for people with severe mental illness. *J Consult Clin Psychol*. 1996;64:391-399.
46. Ames GM, Janes C. A cultural approach to conceptualizing alcohol and the workplace. *Alcohol Health Res World*. 1992;16:112-119.
47. Blustein DL. Integrating career counseling and psychotherapy: a comprehensive treatment strategy. *Psychotherapy*. 1987;24:794-799.
48. Stead P, Rozynko V, Berman S. The SHARP carwash: a community-oriented work program for substance abuse patients. *J Soc Workers*. 1990;35:79-80.
49. Evans WN, Farrelly MC, Montgomery E. Do workplace smoking bans reduce smoking? *Am Econ Rev*. 1999;89:728-747.