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Impact of Efforts to Reduce Inpatient Costs on Clinical Effectiveness

Treatment of Posttraumatic Stress Disorder in the Department of Veterans Affairs

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BACKGROUND. There have been major reductions in the availability of inpatient psychiatric care in the United States in recent years.

OBJECTIVE. The objective of this study was to evaluate the clinical impact of cost-cutting changes in the delivery of inpatient psychiatric care.

DESIGN. This was a nonequivalent control group pre/post design.

SUBJECTS. Outcome data on 6,397 veterans treated between 1993 and 2000 at 35 specialized VA inpatient and residential programs for posttraumatic stress disorder (PTSD) were used to compare changes in effectiveness (measured as patient improvement from admission to 4 months after discharge) at programs that either shortened their average length of stay or converted from a hospital-based program to a low-cost residential rehabilitation program. For comparison, outcome data are also presented over the same years from both inpatient PTSD programs and residential PTSD programs that did not experience program change.

MEASURES. Measures addressed baseline characteristics and 4-month postdischarge outcome measures of PTSD symptoms, substance abuse, violent behavior, and employment.

RESULTS. Analyses of covariance showed no significant change in outcomes at inpatient programs that either reduced their length of stay or did not change at all. However, effectiveness declined on some measures at inpatient programs that converted to residential treatment during this period but improved at residential treatment programs that had been established before this period of change.

CONCLUSIONS. Although there was no deterioration in effectiveness related to reduced length of inpatient stay, programs that converted to a residential model showed decreased effectiveness.

Key words: Outcomes; efficiency; posttraumatic stress disorder. (Med Care 2001;39:168–180)

There have been dramatic changes in the delivery of mental health services in the United States in recent years, primarily reflecting reductions in the delivery of inpatient services driven by efforts to reduce health care costs. In the private sector, several studies report that inpatient service use

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declined by one third or more[1-4] and affected care for people with severe mental illness as much as people with milder disorders. Major changes have also been made in public sector services, and such changes are especially well documented for the VA health care system.[5] Between 1993 and 1999, the VA closed 9,893 mental health inpatient beds, 68% of the 1993 total, and established 1,456 lower-cost residential rehabilitation beds serving diverse diagnostic groups.[6]

There have been few studies of the clinical impact of bed closures or program transformations in either the private or public sector.[7] Three studies have attempted to evaluate the impact of VA bed closures by examining changing rates of involvement in the criminal justice system[8] and spillovers into other health care systems.[9,10] These studies have found either no evidence of effects[8,9] or small effects related to bed closures[10] but have been limited by their lack of evidence concerning the impact of system change on clinical effectiveness (that is, improvement in clinical status from the time of program entry to the period after discharge, eg, reduced symptoms or substance abuse or increased employment).

The treatment of military-related posttraumatic stress disorder (PTSD)[11] is a major priority for the VA health care system, and >50,000 veterans suffering from debilitating problems such as nightmares, flashbacks, and profound social withdrawal seek specialized treatment for war-related PTSD from the VA each year.[12] Research studies suggest that conventional psychosocial and pharmacotherapeutic treatments have limited efficacy, especially in the most severe and persistent cases of PTSD,[13-16] although some recent studies have shown more promising results.[17-19]

A large, multisite outcome study conducted in the VA during the early 1990s suggested that intensive, long-stay inpatient treatment did not result in better clinical outcomes than shorter-term programs and incurred substantially increased costs averaging $18,000 more per patient per year.[13] As a result of this study, as well as broader changes in the VA system,[5,6] there have been changes of 2 major types in the inpatient treatment of PTSD by the VA: inpatient treatment has been curtailed by closing beds and shortening length of stay; and inpatient beds have been replaced by less expensive forms of care provided in residences with less intensive staffing and a less medical focus. These programs, called PTSD Residential Rehabilitation Programs (PRRPs) operate like halfway houses with both a supportive community residential milieu and an active treatment component that includes both psychosocial and pharmacologic treatments and have fewer nurses and medical personnel than inpatient programs.[20]

In 1993, the VA initiated a special outcomes evaluation initiative that collects clinical data at specialized inpatient and residential programs that treat military-related PTSD using standardized questionnaires administered at the time of program entry and 4 months after discharge.[21] In this study, we present clinical outcome data reflecting changes in the effectiveness of treatment for veterans who were treated in specialized inpatient PTSD programs that shortened their average length of stay or converted from a hospital inpatient program to a PRRP. For comparison, we also present data on inpatient programs that did not shorten their length of stay during these years and on PRRPs that were in existence before 1996 and did not change their program. Data from the VA outcome monitoring program provide a unique opportunity to examine the impact on program effectiveness of systematic changes designed to improve the efficiency of treatment.

Methods

In 1993, a national VA initiative was implemented to monitor clinical outcomes from inpatient and residential programs that provide specialized treatment for veterans with military-related PTSD.[21] These programs offer a combination of medication, psychotherapy, and psychosocial rehabilitation services. They pay special attention to the unique sensitivities and experiences of Vietnam veterans who participated in a war that generated unprecedented national controversy and whose veterans, in many cases, received scant support or attention when they returned home, complicating their recovery from war-zone stress.[11,14]

Through the end of January 2000, 62 of these programs had participated in this evaluation effort. The current study focuses on a subset of 35 of these programs that either made specific program changes on a well-defined date or made no major programmatic changes during the 7-year period from June 1993 through January 2000. Some of the 27 excluded programs were closed, while others converted to day hospitals or underwent multiple

changes at various points in time that were not defined well enough to warrant inclusion.

Patients admitted to the 35 included programs were assessed with a brief, standardized, self-report questionnaire at the time of admission and again 4 months after discharge. These questionnaires were completed by veterans either directly or, when necessary, over the telephone. In addition, their primary clinician completed a structured discharge summary describing certain well-defined parameters of their participation in treatment.

Sample

The total sample included 9,482 veterans who were enrolled in the monitoring protocol at the selected study sites between June 1, 1993, and January 31, 2000, and who entered treatment either (1) 2 years before or 2 years after the date of programmatic change at sites that experienced such change or (2) 2 years before and 2 years after a matched index date, described in detail below, at sites that did not change. Veterans who were participating in treatment at the time of program change (ie, who entered a treatment program before the programmatic changes took effect and were discharged after) were excluded (n = 183). The analytic sample was identified as follows.

Annual surveys of programmatic changes identified 7 programs that formally shortened their length of stay between May 1, 1995, and October 1, 1996. These programs treated 1,818 veterans who were admitted during the 2 years before (n = 827) and 2 years after (n = 991) these changes, excluding those who were in the program at the time of the changes. In addition, 14 programs were identified that converted from hospital-based inpatient programs to residential rehabilitation programs between October 1, 1996, and November 30, 1998. These programs treated 4,339 veterans during the 2 years before (n = 2,044) and 2 years after (n = 2,295) these changes, excluding those admitted at the time of the change. Programs were included only if they had 2 full years of data before and after they changed.

While dates of program change were readily available for programs that changed their operating principles, parallel index dates had to be assigned to the comparison programs. Nine comparison inpatient programs were identified that did not programmatically change their length of stay during these years, along with 5 residential programs that were established before October 1996 and did not experience program change. Comparison programs were included only if they had 4 full years of data.

The median entry date of veterans who entered each of the programs that did not experience programmatic change was used to match that program with an inpatient or residential program that did experience such a change. Thus, each of the 9 inpatient programs that did not experience a programmatic reduction in length of stay was matched with 1 of the 7 inpatient programs that did programmatically reduce their length of stay by matching the median date of admission of each unchanged program as closely as possible to the date of programmatic change among the programs that experienced change. The 9 comparison programs treated 2,239 veterans in the 2 years before (n = 1,007) and after (n = 1,232) the assigned index dates.

Similarly, each of the 5 programs that operated continuously as residential treatment programs was matched with 1 of the 14 programs that converted from an inpatient to a residential treatment model, also by matching the median admission date among patients treated at the unchanged program with the closest date of programmatic change among the programs that did change. These 5 comparison programs treated 1,086 veterans in the 2 years before (n = 477) and after (n = 609) the assigned index dates.

This method of matching was chosen to ensure that comparison programs would have similar numbers of pre- and post–index-date patients and so that these index dates would be similar in range to the change dates of programs that changed.

Outcome Assessments

Altogether, 6,377 veterans (67%) were successfully followed up 4 months after discharge, including 67% at inpatient programs that shortened their length of stay, 68% at inpatient programs that changed to residential programs, 70% at inpatient programs that did not change, and 60.3% at residential programs that did not change ($\chi^2 = 32.5$, $df = 3$, $P < 0.001$). Follow-up interviews occurred an average of 138 days (SD = 80) after discharge from the program. Significant pre/post differences in follow-up rates were observed

in programs that changed from inpatient to residential treatment (69% to 65%, $\chi^2 = 4.8$, $df = 1$, $P < 0.03$) and at inpatient programs that did not lower their length of stay (67% to 73%, $\chi^2 = 10.3$, $df = =1$, $P < 0.001$). There were no significant differences in follow-up rates at inpatient programs that lowered their length of stay (69% to 66%, $\chi^2 = 2.5$, $df = 1$, $P < 0.11$) or at residential programs that did not change (58% to 62%, $\chi^2 = 2.1$, $df = 1$, $P < 0.14$).

Comparison of baseline characteristics of veterans who were successfully followed up and those who were not showed that veterans who were followed up were generally better off than those who were not. They had less severe problems with alcohol, drugs, and violence; had fewer psychiatric comorbidities; were less likely to have made a suicide attempt; and were more likely to be working. They were not significantly different, however, on measures of PTSD severity. Veterans who were followed up were also slightly older, less likely to be African American, and more likely to be married and had more severe medical problems at the time of program entry and more years of education.

Measures

Sociodemographic Characteristics. Sociodemographic data obtained at baseline included measures of age, gender, race, marital status, education, history of incarceration, current employment, and receipt of VA compensation for PTSD.

Treatment Process Measures. Treatment process measures recorded length of stay; time on the waiting list before admission; plans to participate in program reunions; the discharging clinician's assessment of the veteran's commitment to treatment (5-point Likert-type scale); whether medications were prescribed at discharge; whether the veteran had previous specialized PTSD treatment; and the traveling distance from the veteran's residence to the facility in which the program was located.

Clinical Outcome Measures. Clinical outcomes that were assessed to evaluate program effectiveness included PTSD symptoms, substance abuse, violent behavior, and employment.

Because of their particular significance for specialized PTSD programs, PTSD symptoms were measured in 2 ways: (1) with the short form of the Mississippi Scale for Combat-Related PTSD (range, 11–55), an instrument that has been validated in a large sample of outpatients,[22] and (2) a 4-item PTSD scale (range, 4–20) developed at the Northeast Program Evaluation Center (the NEPEC PTSD scale) (Cronbach $\alpha = 0.67$). The NEPEC PTSD Scale correlates 0.61 and 0.74 with the Short Mississippi Scale at admission and at the 4-month follow-up, respectively. Thus, the NEPEC PTSD Scale and the Short Mississippi Scale correlation is sufficiently large to indicate that they are measuring the same domain but not so large as to be redundant .

In an intensive outpatient PTSD study,[23] the NEPEC PTSD Scale and the Short Mississippi Scale correlated 0.63 and 0.64, respectively, with a continuous PTSD score derived from the SCID PTSD module (Structured Clinical Interview for DSM-III).[24] Additionally, in an outcome study of intensive inpatient treatment of PTSD,[13] the NEPEC PTSD Scale and the Short Mississippi Scale correlated 0.40 and 0.39, respectively, with the Clinician Administered PTSD Scale, a well-validated observer rating scale.[25,26] The modest magnitude of these correlations most likely reflects the differences between self-report and rater-administered assessment methods.

Alcohol abuse and drug abuse were measured using the composite indexes from the Addiction Severity Index (range, 0–1),[27] a widely used and well-validated measure of substance abuse outcomes. Violent behavior was measured by 4 items that were adapted from the National Vietnam Veterans Readjustment Study (range, 0–4)[11]: (1) destruction of property, (2) threatening someone with physical violence without a weapon, (3) threatening someone with a weapon, and (4) physically fighting with someone (Cronbach $\alpha = 0.71$). Employment was measured using reported earned income (range, \$0–\$9,850).

Data Analysis

Analysis proceeded in several steps. Since changes in sociodemographic or clinical characteristics of the veteran population entering these programs could bias our assessment of change in outcomes over different phases of program operation (ie, before and after the period of programmatic change), we first conducted a series of analyses of variance) to identify veteran baseline characteristics and treatment processes (other than length of stay and program type) that changed significantly from the early phase of the

evaluation (before the identified dates of programmatic change) to the later phase (after the dates of programmatic change). We also examined the interaction of program type and program phase since characteristics that changed at some programs but not others could also confound our analyses. Baseline measures that were significantly different for either the main effect of phase (pre/post program change) or in the interaction of program type and phase were included as covariates in all subsequent analyses.

Next, we created 6 measures of program effectiveness (ie, the amount of clinical improvement) by subtracting measures of health status at program entry from measures obtained 4 months after discharge. We then conducted a series of analyses of covariance in which the dependent variables were these measures of program effectiveness. These models compared program effectiveness on each outcome measure before and after the period of program change, controlling for potentially confounding measures identified previously (and including the baseline value of the change score), and were used to determine whether there had been significant change in effectiveness in association with programmatic change.

These models also included a term reflecting overall differences in effectiveness across program types and an interaction term representing the significance of differences between the 4 types of programs in the amount of change in program effectiveness for the years under study. This last term was designed to determine whether effectiveness had increased or decreased differentially between the 4 types of programs. All analyses were conducted in SAS (R) version 6.12.

Results

Sample

Table 1 compares veterans who entered these programs before the dates of programmatic change with veterans who entered after these dates on their personal characteristics and program participation. Those admitted after the dates of programmatic change were somewhat older, were more likely to be Hispanic, and had somewhat less exposure to atrocities and combat. They had less evidence of substance abuse problems and less violent behavior but did not differ on measures of PTSD severity. They were less likely to have been hospitalized just before admission (ie, to have been transferred from another inpatient unit). Although they were more likely to be treated with medications, there were no differences on other measures of treatment process overall, although there were significant differences across program types. Although many of these comparisons were significant, they were generally small in magnitude, with differences of <10% with the single exception of the much smaller proportion of patients who had been hospitalized before admission (69.9% versus 21.1%). While several interaction effects between phase and program type were significant, the size of these effects was of similarly modest magnitude.

Length of Stay

While length of stay in the inpatient and residential programs that did not experience programmatic change increased by 11.7% and 1.2%, respectively (Table 2), programs than initiated deliberate reductions in length of stay saw a decline in length of stay of 21%, and those that changed to a residential model experienced a decline in length of stay of 6%.

Effectiveness

When data from all 35 programs were combined, there were no significant changes in the effectiveness of these programs on any measure (Table 3). For each outcome measure, the table shows the average entry score on each measure, the average amount of clinical change from admission to 4 months after community reentry (adjusted for baseline values and covariates), and the percent change in the baseline score. These figures are presented twice: first for the period before programmatic change and then for the period after the programmatic change. The statistical tests in the final 3 columns refer to the significance of differences in program effectiveness before and after either the dates of programmatic change or the assigned index dates for programs that did not change, controlling for entry values and other covariates identified previously.

There were a few significant differences in change across the 4 program types on 5 of the 6 measures (Tables 4 through 8). There were no changes on the Short Mississippi PTSD scale at programs that changed, although unchanged residential programs showed statistically significant improvement in out-

TABLE 1. Admission Characteristics and Treatment Process Before and After Program Changes

Measure	Before (n = 2,914)	After (n = 3,483)	Phase (Before vs After)			Program Type × Phase*		
			F/χ^2	*df*	*P*	F/χ^2	*df*	*P*
Sociodemographics								
Age (SD)	48.83 y (5.70 y)	50.03 y (5.46 y)	65.49	1, 6370	0.0001	3.56	3, 6370	0.013
Gender (male)	98.1%	99.3%	0.20	1	0.65	11.02	3	0.01
African American	21.1%	22.4%	3.26	1	0.06	3.87	3	0.27
Hispanic	4.4%	6.5%	6.19	1	0.01	3.66	3	0.30
Education (SD)	12.76 y (2.15 y)	12.87 y (2.02 y)	0.78	1, 6370	0.38	3.37	3, 6370	0.02
Married	44.8%	40.1%	1.84	1	0.18	3.33	3	0.34
Service connected for PTSD	48.4%	48.3%	0.06	1	0.80	9.92	3	0.02
Service connected for any illness	66.7%	66.5%	0.05	1	0.83	4.37	3	0.220
Participated in atrocities	28.0%	25.1%	11.78	1	0.001	10.56	3	0.014
Received fire in combat zone	95.5%	94.2%	6.67	1	0.01	7.25	3	0.060
Clinical status								
Comorbid psychiatric illnesses (SD)	2.48 (1.27)	2.46 (1.21)	7.10	1, 6372	0.008	7.30	3, 6372	0.0001
Alcohol abuse	55.8%	54.2%	6.67	1	0.010	10.21	3	0.017
Drug abuse	33.5%	33.3%	1.70	1	0.19	3.51	3	0.32
Suicide attempt	51.6%	49.0%	4.23	1	0.04	6.06	3	0.11
PTSD, Short Mississippi Scale (SD)	40.77 (5.62)	40.80 (5.74)	0.05	1, 6376	0.83	1.85	3, 6376	0.13
PTSD, 4-item scale (SD)	1.79 (1.38)	1.69 (1.34)	0.25	1, 6373	0.62	1.02	3, 6373	0.38
Alcohol problems, ASI (SD)	0.19 (0.23)	0.15 (0.23)	37.30	1, 6374	0.0001	2.70	3, 6374	0.04
Drug problems, ASI (SD)	0.07 (0.10)	0.06 (0.10)	53.98	1, 6373	0.0001	10.36	3, 6373	0.0001
Violence (SD)	1.79 (1.38)	1.69 (1.34)	1.77	1, 6396	0.004	2.66	3, 6376	0.04
Hospitalized at admission	59.9%	21.1%	1134.02	1	0.001	302.90	3	0.001
Medical problems	60.9%	61.8%	0.28	1	0.598	14.42	3	0.002
Community adjustment								
Employed	14.7%	15.8%	0.06	1	0.81	2.34	3	0.505
Employment earnings, past month (SD)	$216 ($606)	$190 ($566)	3.37	1, 6355	0.06	0.26	3, 6355	0.85
Incarcerated in past	57.8%	59.1%	0.21	1	0.65	4.27	3	0.233
Program participation								
Length of stay (SD)	46.18 d (31.27 d)	45.49 d (33.72 d)	1.94	1, 6352	0.16	13.49	3, 6352	0.0001
Distance of residence from VA (SD)	96.7 mi (55.7 mi)	97.2 mi (55.6 mi)	0.07	1, 6336	0.79	1.10	3, 6336	0.34
Time on waiting list (SD)	46.3 d (69.3 d)	43.2 d (60.8 d)	0.67	1, 6327	0.41	5.68	3, 6327	0.0007
Plan to participate in reunions	69.8%	62.4%	40.47	1	0.001	74.76	3	0.001
Personal commitment to therapy (SD)	2.62 (0.90)	2.57 (0.87)	0.64	1, 6349	0.42	12.14	3	0.0001
Prescribed medications	79.4%	84.2%	25.46	1	0.001	12.37	3	0.01
Previous specialized PTSD treatment	43.6%	44.5%	0.94	1	0.33	13.18	3	0.004

*Breslow-Day test for homogeneity of the odds ratios.

comes of small magnitude (from 1.1% to 7.8% improvement). The same pattern of change in effectiveness across program types was observed on the NEPEC PTSD scale (Table 5). On the ASI alcohol and drug composite scores (Tables 6 and 7) and on the violent behavior scale (Table 8), programs that shifted to the residential model became significantly less effective (eg, from 19.9% improvement in alcohol problems before to 6.8% improvement after), while residential programs that did not change once again became substantially more effective (from 2.9% improvement in alcohol problems before to 24% improvement after).

Graphic presentation of change in PTSD symptoms on the Short Mississippi PTSD Scale, for example, shows steady improvement in outcomes (ie, greater reductions in scores) from 1 year before the index date at residential programs that did not change but little change at the other program types (the Figure).

Discussion

This study traced changes in clinical improvement over a 4-year period during which special-

TABLE 2. Changes in Length of Stay in Specialized PTSD Programs Before and After Program Changes, by Program Type*

Program Type	n	Before Changes	n	After Changes	Percent Change	t	P
Inpatient program, reduced stay (SD)	567	39.6 (30.7)	651	31.1 (18.9)	−21.4	4.99	0.0001
Changed to residential program (SD)	1,402	43.3 (29.0)	1,513	40.6 (20.5)	−6.2	2.43	0.0001
Unchanged inpatient program (SD)	669	47.0 (29.8)	1,069	52.5 (44.8)	11.7	4.32	0.0001
Unchanged residential program (SD)	276	72.6 (33.7)	250	73.4 (27.2)	1.2	0.37	0.71

*Interaction between program type and period of time: $F = 43.07$, $df = 3, 9479$, $P < 0.0001$.

ized VA inpatient PTSD programs experienced major programmatic changes designed primarily to improve efficiency. We evaluated change in clinical effectiveness associated with 2 types of programmatic change: one involving reduction in length of stay and the other involving a shift from an inpatient model to a residential model of treatment. For comparison, we also traced changes in effectiveness in 2 types of programs that did not undergo programmatic change.

Our results were mixed. Among the inpatient programs, those that shortened their lengths of stay or did not change programmatically showed no change in effectiveness over these years on any measure. Thus, the reduction in length of stay seems to have had no adverse effect on program effectiveness, a finding that is consistent with a previous study that showed no greater effectiveness for long-stay compared with short-stay inpatient PTSD programs.[13]

In contrast, programs that shifted from an inpatient to a residential model were less effective on the alcohol and drug composite problem measures and on the violent behavior measure after these changes. It is noteworthy, in contrast, that residential treatment programs that had been established before this period of change showed improvement in almost all outcome domains over these years.

Residential rehabilitation programs were new to the VA during the 1990s, and the clinical staff implementing them may not have been comfortable providing treatment in less controlled and less richly staffed settings, especially during the period immediately after the programmatic change. The effectiveness of residential programs is often dependent on a constructive patient-maintained culture, especially for addressing issues such as abstinence from substance use that involve self-control. Since such cultures are likely to take time to develop, it is plausible that programs that shifted from an inpatient to residential approach lost some of their effectiveness during the transitional period.

It is striking that residential programs that were in operation through the full period of time and that therefore did not experience any programmatic change showed significantly greater effectiveness in addressing PTSD symptoms, alcohol abuse, drug abuse, and violent behavior during the later years of the study. A possible explanation is that these programs were among the first residential rehabilitation programs developed within the VA system, and as noted above, it may have taken several years for staff in these programs to gain experience and confidence providing treatment in less restrictive, more naturalistic settings and, as also noted above, for a constructive patient culture to emerge. In addition, it is possible that since the first wave of residential programs were not specifically implemented to reduce costs but rather to implement a new, more flexible treatment model, their startup could have been experienced more positively, as something added rather than something taken away. In contrast, since the shift from inpatient to residential programs was imposed, in most cases, to reduce costs rather than to shift to an innovative new model, the implementation of this new approach may have had reduced staff commitment and identification with program and adversely affected staff morale.

While changes in the social environment could potentially reduce the effectiveness of any psychiatric treatment program, especially with respect to

TABLE 3. Changes in Outcomes in Specialized PTSD Programs Before and After Program Changes

Outcome Measure	Before Program Changes (n = 2,914)			After Program Changes (n = 3,483)					
	Admission	Change*	% Change	Admission	Change*	% Change	F	*df*	*P*
PTSD, Short Mississippi Scale (SD)	40.76 (5.62)	−1.79	−4.4	40.84 (5.76)	−2.37	−5.8	0.18	1, 5838	0.67
NEPEC PTSD Scale (SD)	17.15 (2.32)	−0.99	−5.8	17.07 (2.48)	−1.23	−7.2	1.8	1, 5832	0.18
Alcohol problem index, ASI (SD)	0.187 (0.226)	−0.020	−10.9	0.157 (0.230)	−0.021	−13.3	0.02	1, 5831	0.89
Drug problem index, ASI (SD)	0.075 (0.103)	−0.009	−11.7	0.061 (0.103)	−0.014	−22.8	0.45	1, 5831	0.50
Violent behavior (SD)	1.79 (1.38)	−0.63	−35.3	1.70 (1.35)	−0.68	−40.1	0.82	1, 5834	0.36
Employment earnings (SD)	$ 214 ($605)	−52.92	−24.7	$ 190 ($554)	−26.40	−13.9	0.56	1, 5795	0.46

*Average change in patient outcomes adjusted for baseline sociodemographic and clinical characteristics (least squares means).

TABLE 4. Changes in PTSD Outcomes (Short Mississippi Scale) in Specialized PTSD Programs Before and After Program Changes, by Program Type*

Program Type	Before Program Changes				After Program Changes					
	n	Admission (Patient)	Change†	% Change	n	Admission (Patient)	Change†	% Change	*t*	*P*
Inpatient program, reduced stay (SD)	546	40.14 (5.99)	−0.81	−2.0	646	40.56 (5.96)	−1.01	−2.5	1.55	0.12
Changed to residential program (SD)	1,324	41.07 (5.60)	−1.79	−4.4	1,183	41.00 (5.58)	−2.37	−5.8	−0.52	0.59
Unchanged inpatient program (SD)	637	40.91 (5.88)	−3.38	−8.3	872	40.39 (5.37)	−3.12	−7.7	0.73	0.47
Unchanged residential program (SD)	266	40.98 (5.77)	−0.44	−1.1	365	41.20 (5.67)	−3.20	−7.8	−5.24	0.0001

*Interaction between program type and period of time: F = 10.59; *df* = 3, 5838, $P < 0.0001$.
†Average change in patient outcomes from baseline to follow-up, adjusted for baseline sociodemographic and clinical characteristics (least squares means).

TABLE 5. Changes in PTSD Outcomes (NEPEC Scale) in Specialized PTSD Programs Before and After Program Changes, by Program Type*

	Before Program Changes				After Program Changes					
Program Type	n	Admission (Patient)	Change†	% Change	n	Admission (Patient)	Change†	% Change	*t*	*P*
Inpatient program, reduced stay (SD)	545	17.24 (2.31)	−0.55	−3.2	646	17.07 (2.42)	−0.69	−4.0	−0.79	0.42
Changed to residential program (SD)	1,322	17.24 (2.31)	−1.21	−7.0	1,182	17.07 (2.42)	−1.22	−7.1	0.007	0.99
Unchanged inpatient program (SD)	637	17.08 (2.27)	−1.48	−8.6	872	17.06 (2.33)	−1.48	−8.7	−0.01	0.99
Unchanged residential program (SD)	266	17.25 (2.41)	−0.72	−4.2	365	17.14 (2.39)	−1.54	−9.0	−3.6	0.0003

*Interaction between program type and period of time: $F = 3.92$; $df = 3, 5832$, $P < 0.008$.
†Average change in patient outcomes from baseline to follow-up, adjusted for baseline sociodemographic and clinical characteristics (least squares means).

TABLE 6. Changes in Alcohol Problems in Specialized PTSD Programs Before and After Program Changes, by Program Type*

	Before Program Changes				After Program Changes					
Program Type	n	Admission (Patient)	Change†	% Change	n	Admission (Patient)	Change†	% Change	*t*	*P*
Inpatient program, reduced stay (SD)	546	0.221 (0.227)	−0.017	−7.6	646	0.187 (0.231)	−0.035	−18.6	1.72	0.083
Changed to residential program (SD)	1,321	0.161 (0.221)	−0.032	−19.9	1,179	0.148 (0.235)	−0.010	−6.8	3.12	0.002
Unchanged inpatient program (SD)	637	0.202 (0.225)	−0.027	−13.4	872	0.150 (0.219)	−0.035	−23.6	−0.86	0.39
Unchanged residential program (SD)	266	0.203 (0.232)	−0.006	−2.9	365	0.148 (0.224)	−0.036	−24.1	2.09	0.04

*Interaction between program type and period of time: $F = 5.88$; $df = 3, 5831$, $P < 0.0005$.
†Average change in patient outcomes from baseline to follow-up, adjusted for baseline sociodemographic and clinical characteristics (least squares means).

TABLE 7. Changes in Drug Problems in Specialized PTSD Programs Before and After Program Changes, by Program Type*

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	Before Program Changes				After Program Changes					
Program Type	n	Admission (Patient)	Change†	% Change	n	Admission (Patient)	Change†	% Change	t	P
Inpatient program, reduced stay (SD)	546	0.091 (0.113)	−0.008	−8.8	646	0.076 (0.111)	−0.014	−18.1	−1.31	0.19
Changed to residential program (SD)	1,321	0.059 (0.087)	−0.011	−18.8	1,179	0.060 (0.111)	−0.005	−8.3	2.21	0.03
Unchanged inpatient program (SD)	637	0.086 (0.106)	−0.009	−10.5	872	0.053 (0.081)	−0.012	−22.8	−0.95	0.34
Unchanged residential program (SD)	266	0.098 (0.127)	0.004	4.1	365	0.060 (0.103)	−0.017	−28.3	−3.58	0.0003

*Interaction between program type and period of time: $F = 6.60$; $df = 3, 5831$, $P < 0.0002$.
†Average change in patient outcomes from baseline to follow-up, adjusted for baseline sociodemographic and clinical characteristics (least squares means).

TABLE 8. Changes in Violent Behavior in Specialized PTSD Programs Before and After Program Changes, by Program Type*

	Before Program Changes				After Program Changes					
Program Type	n	Admission (Patient)	Change†	% Change	n	Admission (Patient)	Change†	% Change	t	P
Inpatient program, reduced stay (SD)	546	1.66 (1.38)	−0.51	−30.8	646	1.66 (1.38)	−0.50	−30.3	0.12	0.91
Changed to residential program (SD)	1,322	1.85 (1.38)	−0.82	−44.2	1,182	1.76 (1.34)	−0.72	−40.9	2.11	0.03
Unchanged inpatient program (SD)	637	1.71 (1.39)	−0.72	−41.9	872	1.52 (1.30)	−0.80	−52.5	−1.26	0.21
Unchanged residential program (SD)	266	1.91 (1.37)	−0.48	−25.2	354	1.99 (1.41)	−0.70	−35.4	−2.36	0.02

*Interaction between program type and period of time: $F = 3.9$; $df = 3, 5834$, $P < 0.009$.
†Average change in patient outcomes from baseline to follow-up, adjusted for baseline sociodemographic and clinical characteristics (least squares means).

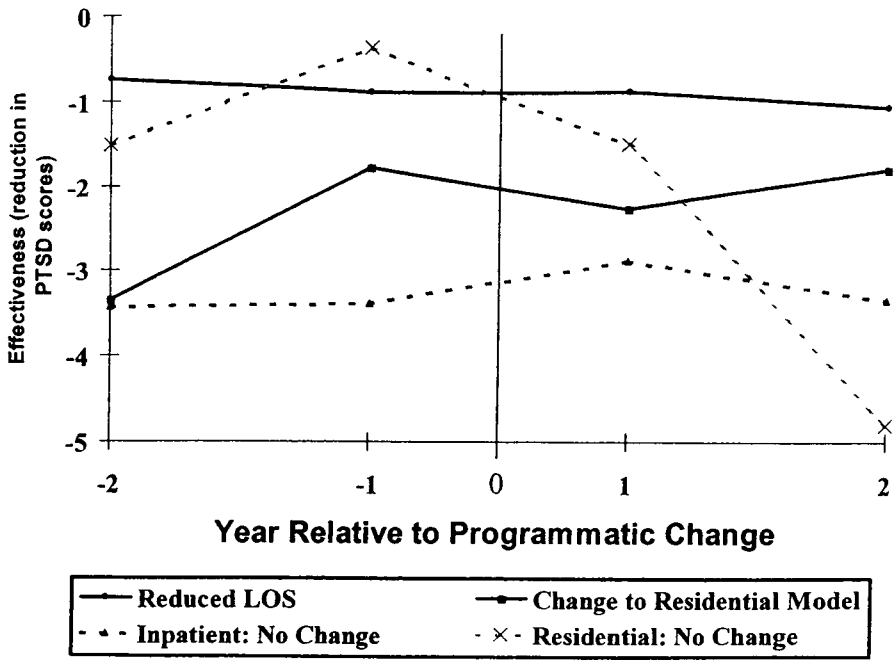

FIG. Effectiveness of PTSD treatment measured as the improvement, ie, reduction, from baseline to 4 months after discharge on the Short Mississippi PTSD Scale before and after programmatic change by program type. The x-axis represents years before programmatic change (−2 to −1) and after programmatic change (+1 to +2). LOS indicates length of stay.

substance abuse outcomes, Vietnam veterans may be especially responsive to changes in staff morale or attentiveness because of experiences in Vietnam in which they made great personal sacrifices in a demoralized military force for a society that was unable to provide them with strong support and that was unwelcoming when they returned home.

Study Limitations

Several limitations of this study deserve comment. First, as in any naturalistic study in which random assignment to alternative interventions is not possible, differences in baseline characteristics across treatment groups can confound the results. Overall, patients seen in the period that followed programmatic change had less severe substance abuse problems and less violence than those seen before, but they did not differ on other clinical measures. It is not clear how these differences may have affected our results, and multiple regression analysis was used to adjust for all significant differences both across phases and between programs across time phases. We cannot, however, rule out the possibility that some of our results reflect unmeasured differences in program entrants rather than changes in the effectiveness of different program types.

Second, because the data were collected as part of standard program operation rather than as part of a specially funded research study, follow-up rates averaged 67%, with a range of 60% to 70% across program types. While this is an impressively higher rate than some other outcome monitoring efforts,[28] it is less than the 70% to 80% standard applied to most research studies. Since veterans successfully followed up were better off at the time of program entry than those who were not, with fewer alcohol, drug, and psychiatric comorbidities, it is likely that those who were doing less well clinically after discharge were less likely to be successfully followed up. A significant decline in pre/post follow-up rates was observed in programs that changed from inpatient to residential treatment (69% to 65%), which should have resulted in greater improvement with time, although the observed improvement actually declined. In contrast, there were no significant differences in follow-up rates at residential programs that did not change (58%–62%), although there was sig-

nificantly greater improvement at these sites. Thus, our findings do not seem to be explained by changes in follow-up rates.

Third, some veterans who received treatment from the programs under study were not enrolled in the outcome monitoring program. These were most likely veterans who were discharged prematurely and did not participate long enough to be enrolled in the monitoring effort. It is not clear whether or how this would bias our results.

Fourth, since we compared 5 different outcome measures across 4 different program types, we conducted 20 different comparisons, one of which might have been significant with an α of $P < 0.05$ by chance alone. Since we had 8 significant findings, it seems unlikely that our results are attributable to chance. Applying a conservative, Bonferroni-corrected α level to our 20 comparisons of $0.05/20 = 0.0025$, 4 of these findings remain significant, primarily those showing improved outcomes at residential programs that did not change.

Fifth, since individual patients were clustered within 35 programs, outcomes for patients treated within the same programs may be correlated with one another, violating the assumption of independence of observations that underlies inferential statistics. We repeated these analyses using hierarchical linear modeling[29] with PROC MIXED of SAS (R), which adjusts standard errors of correlated observations, and replicated our results. Intraclass correlations in these models were 12% to 13% for the 2 PTSD measures and 2% to 6% for the other measures, suggesting only a low level of intercorrelation of outcomes within programs.

Sixth, while this study shows that patients who received services after the period of programmatic change had outcomes generally equal to those treated previously, it does not address the experiences of patients who would have received inpatient care in the past but were only offered outpatient care after the changes. It is not known how many such patients there are, nor are their distinctive clinical characteristics and needs identified. However, in evaluations of the full impact of reductions in the availability of inpatient care, it is important to assess the effect on both patients who receive alternative inpatient or residential treatment and on patients who receive only outpatient treatment.

Finally, this study addressed only treatment of PTSD in VA inpatient programs that had moderately long lengths of stay. The generality of these findings to other health care systems, to other illnesses, and to change in programs that have short lengths of stay is unknown. In the only comparable study of which we are aware, outcomes of treatment for major depression were evaluated in a private hospital at which length of stay was reduced over an 8-year period from 26.5 to 8.3 days.[7] That study found greater depression and poorer functioning 1 month after discharge among patients treated after lengths of stay were reduced, suggesting that there is a point at which reduced length of stay results in adverse clinical effects, at least in major affective disorder. Average lengths of stay in the programs studied here did not reach such low levels.

Conclusions

There was no overall deterioration in outcomes at specialized VA PTSD programs in association with programmatic changes designed to increase their efficiency. However, while shortening length of stay was associated with no deterioration in effectiveness, conversion to a residential rehabilitation model was associated with decreased effectiveness, at least initially and when these changes were made primarily to improve efficiency. This does not seem to be a general limitation of the residential model since residential programs initiated before the period of cost-driven change showed continued improvements in effectiveness.

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