

Regular article

# Outcomes and costs of matching the intensity of dual-diagnosis treatment to patients' symptom severity

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## Abstract

This study evaluated a patient–treatment matching strategy intended to improve the effectiveness and cost-effectiveness of acute treatment for dual-diagnosis patients. Matching variables were the severity of the patient's disorders and the program's service intensity. Patients ( $N = 230$ ) with dual substance use and psychiatric disorders received low or high service-intensity acute care in 1 of 14 residential programs and were followed up for 1 year (80%) using the Addiction Severity Index. Patients' health care utilization was assessed from charts, Department of Veterans Affairs (VA) databases, and health care diaries; costs were assigned using methods established by the VA Health Economics Resource Center. High-severity patients treated in high-intensity programs had better alcohol, drug, and psychiatric outcomes at follow-up, as well as higher health care utilization and costs during the year between intake and follow-up than did those in low-intensity programs. For moderate-severity patients, high service intensity improved the effectiveness of treatment in only a single domain (drug abuse) and increased costs of the index stay but did not increase health care costs accumulated over the study year. Moderate-severity patients generally had similar outcomes and health care costs whether they were matched to low-intensity treatment or not. For high-severity patients, matching to higher service intensity improved the effectiveness of treatment as well as increased health care costs. Research is needed to establish standards by which to judge whether the added benefits of high-intensity acute care justify the extra costs. © 2006 Elsevier Inc. All rights reserved.

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## 1. Introduction

Increasing numbers of dual-diagnosis patients present challenges to health care systems (Burnam et al., 1995; Hayes et al., 2003; Lehman, Myers, Dixon, & Johnson, 1994). Compared with either substance misuse or psychiatric patients, patients with both problems use more services (Drake, Mueser, Clark, & Wallach, 1996; Jerrell & Ridgely, 1995). The availability of services for dual-diagnosis patients has been diminished by efforts to reduce the lengths of inpatient and residential stays to reduce health care costs, as well as by the press to provide treatment in less restrictive settings (Nuttbrock, Rahav, Rivera, Ng-Mak, & Link, 1998).

Historically, dual-diagnosis patients have not received adequate services; thus, efforts have focused on identifying those patients who require more intensive services and on developing and evaluating new treatment programs to ensure that such patients receive appropriate care. However, it is equally important to identify patients who do not require more intensive and more costly interventions (Avants, Margolin, Koston, Rounsaville, & Schottenfeld, 1998). One reason why some patients may not need or benefit from more intensive services is that they are relatively stable; that is, they have less severe problems despite their substance use and psychiatric disorders. In addition, providing services that are more intensive than some dual-diagnosis patients' need may inadvertently increase their reliance on others and hamper their capacity for self-management. Moreover, it represents a waste of resources.

This study evaluated a patient–treatment matching strategy intended to improve the effectiveness and cost-

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effectiveness of residential treatment for patients with dual substance use and psychiatric disorders. Its main objective was to examine whether or not the matching strategy resulted in better treatment outcomes and less health care utilization at a 1-year follow-up in a national sample of patients in the Department of Veterans Affairs (VA) programs and community programs under contract to the VA. In the evaluation, the patient matching variable was clinical status as measured by the severity of patients' substance use and psychiatric problems. The treatment matching variable was service intensity, that is, the extent to which health, treatment, and recreational services were offered by the program.

### *1.1. Program service intensity and patient outcomes*

Overall, patients with substance use and psychiatric disorders treated in programs with more service intensity have better outcomes than do patients treated in low service-intensity programs (Alterman, McLellan, & Shifman, 1993; Ouimette, Ahrens, Moos, & Finney, 1998; Rosenheck & Seibyl, 1997). However, the extent and direction of relationships between treatment program characteristics such as service intensity and treatment outcomes depend on the nature of patients' impairments (Waltman, 1995). Patients with a severe disorder need highly service-intensive treatment programs to compensate for and correct the inadequacy of their own internal controls. Insufficient service-intensive placements for these patients contribute to repeated relapse, decompensation, and rehospitalization (Mattson et al., 1994; Moos, Schaefer, Andrassy, & Moos, 2001). Dual-diagnosis patients with moderate disorders tend to do well in programs with a broader range of intensity (Simpson, Joe, Fletcher, Hubbard, & Anglin, 1999). Nonetheless, a program that is rich in services may create a treatment environment so lacking in opportunities for personal control, demand, and challenge that better functioning patients respond maladaptively, that is, with continued reliance on others and high levels of health care utilization (Timko & Moos, 1989; Timko, Nguyen, Williford, & Moos, 1993).

Research findings support these hypothesized associations between dual-diagnosis patients' symptom-severity and program service-intensity needs. A study of mental health residential treatment found that poorly functioning patients who received more services experienced less withdrawal and apathy and more life satisfaction, but that, among well-functioning patients, more services were associated with more withdrawal and apathy and less satisfaction (Timko et al., 1993). Randomized studies of nonresidential programs also suggest that more severely ill dual-diagnosis patients have better outcomes (e.g., better attendance and retention, less substance use) when they receive high-intensity treatment, whereas lower severity clients may benefit somewhat more from low-intensity treatment (Carroll et al., 1994; Thornton, Gottheil, Weinstein, & Karachsky, 1998).

A prospective study matched alcohol- or drug-dependent patients with more severe psychiatric problems to high-intensity programs, and those having milder psychiatric problems were matched to low-intensity programs. Specifically, patients in the low psychiatric-severity (asymptomatic, no history of psychiatric problems) groups were considered matched when they received outpatient substance use disorder treatment. High psychiatric-severity (pronounced symptoms, history of recurring symptoms) patients were considered matched when they were placed in inpatient or residential psychiatric (not substance abuse) programs. Moderate-severity (significant symptoms but no recurrent history) patients were considered matched to particular programs (e.g., therapeutic community, a research-based program making alcohol available at fixed intervals) based on the pattern and severity of their other problems (e.g., employment, family). Compared with mismatched patients, matched patients had better 6-month outcomes; in addition, during treatment, matched patients were rated as more motivated for treatment, stayed in treatment longer, and had fewer irregular discharges (McLellan, Woody, Luborsky, O'Brien, & Druley, 1983).

This study was built on that of McLellan et al. (1983) in which patients were diagnosed with substance use disorders, enrolled at one site, and followed up for 6 months, by selecting and following up for 1 year patients diagnosed with both substance use and psychiatric disorders who were treated in programs throughout the United States. We were also able to add to McLellan et al.'s methods by assessing patients' postdischarge health services utilization as well as the costs of the initial treatment episode and postdischarge care. All patients in this study were clinically assessed to be more appropriately treated in inpatient rather than outpatient substance abuse programs and were considered matched or unmatched based only on their dual substance use and psychiatric disorders and the service intensity of their treatment program.

### *1.2. Program service intensity and postdischarge health care utilization*

Outcome indicators for clients with dual disorders should include mental health and medical care utilization in addition to substance use and psychosocial functioning (Jerrell & Ridgely, 1995). This is because of heightened concern over the escalating costs of health services and the need to contain them. The challenge is to help patients improve on substance use and psychiatric functioning using the least amount and lowest level of care, without under-treating patients such that residential program utilization is shifted from the index stay to the postdischarge period (Magura et al., 2003; Pacione & Jaskula, 1994). Despite the importance of this issue, research has not examined utilization following low or high service-intensity acute care. Compared with patients in less service-intensive programs, those in more service-intensive programs may

have a longer index episode of care and may have more outpatient visits after discharge, indicating that more service-intensive programs may do a relatively good job of engaging patients in follow-up care (Sledge et al., 1996).

We hypothesized that patients with severe clinical problems who received acute treatment in high rather than low service-intensity programs would have better 1-year substance use and psychiatric outcomes, more continuing outpatient mental health care, and less postdischarge inpatient or residential mental health care. In contrast, patients with moderate clinical problems should have similar or even better outcomes in programs with low service intensity than in high service-intensive programs. Specifically, patients who were moderately ill should have no greater use of mental health inpatient/residential services and no less use of outpatient aftercare, following discharge from a low-intensity program, than if they had been discharged from high-intensity acute care. We examined the costs and cost-effectiveness of the health care utilized by patients with highly or moderately severe substance use and psychiatric symptoms in high versus low service-intensity programs.

## 2. Materials and methods

### 2.1. Procedure

Study participants were dual-diagnosis patients who received treatment in 1 of 14 residential substance abuse programs that treated patients with co-occurring psychiatric disorders. Seven programs were affiliated with the VA and 7 were community programs that contracted with the VA to provide treatment services for veterans; these 7 programs also provided services to nonveterans. The programs, located throughout the United States, were rated on Service Intensity, which is a measure taken from the Residential Substance Abuse and Psychiatric Programs Inventory, assessing the availability of 31 health and treatment services and 10 social-recreational services within the program (Timko, 1995; Timko, Lesar, Engelbrekt, & Moos, 2000). The measure's item scores are summed, and raw scores are converted to percentage scores (0% to 100%).

Each program was classified as high intensity or low intensity. Specifically, high-intensity programs scored above the median (72.8%) of a national sample of 406 hospital programs on Service Intensity; low-intensity programs scored below the hospital program median on this measure (Timko & Sempel, 2004). In the national sample, the internal consistency of the measure was good (Cronbach's  $\alpha = .81$ ; Timko & Sempel, 2004). The 6 high-intensity programs (3 VA, 3 community) were comparable on service mix (i.e., all 6 programs provided 23 [56%] of the 41 services, at least 5 programs offered an additional 11 [27%] services, and at least 4 programs offered the remaining 7 [17%] services) and were more likely than

the 8 low-intensity programs (4 VA, 4 community) to provide different types of substance abuse, psychiatric, counseling, rehabilitation, and social-recreational services (Timko & Sempel, 2004). The high-intensity programs were located in the Midwest, Northeast, and West; they ranged in size from 15 to 24 beds and on length of stay from 32 to 180 days, and had Service Intensity scores ranging from 86.2% to 95.2%. The low-intensity programs were located in the Midwest, Northeast, and South; they ranged in size from 20 to 65 beds and on length of stay from 21 to 180 days and had Service Intensity scores ranging from 53.2% to 70.3%.

All participants signed an informed consent form after receiving a complete description of the study. The procedures that followed were in accord with the standards of the Institutional Review Board at Stanford University Medical Center. Participants were evaluated using the Addiction Severity Index (ASI; McLellan et al., 1992) during an initial period of stabilization. The ASI is a structured, 40-minute clinical research interview that assesses the severity of seven problem areas, three of which are reported here: alcohol use, drug use, and psychiatric. Two different scores are produced for each area: severity ratings represent global clinical judgments of the patient's problems, whereas composites represent a summary of specific indices that reflect the patient's status at baseline and outcome.

The 10-point severity ratings are used for initial treatment planning and referral. When interviewers are trained and monitored (Alterman et al., 2001), as they were in this study, severity ratings provide valid, reliable (i.e., internally consistent and consistent across testing occasions and raters), independent, and clinically useful estimates of problem severity (McLellan et al., 1985; Stoffelmayr, Mavis, & Kasim, 1994). In each domain, severity ratings of 2 or higher represent a moderate to extreme problem, with treatment indicated or necessary (McLellan et al., 1983).

Baseline data were collected by an on-site research assistant. All research assistants were trained (e.g., reviewed the project manual; viewed ASI training videos; observed, and were observed by, experienced interviewers), monitored (e.g., checked for "drift" [Fureman, McLellan, & Alterman, 1994] and for missing and incomplete data), and given feedback during both on-site and telephone meetings with senior project staff.

### 2.2. Participants

Of 263 potential participants, 230 (87.5%) provided informed consent and met eligibility criteria, that is, had co-occurring substance use and psychiatric disorders according to the medical record, and were clinically evaluated by program staff as not an immediate danger to themselves or others. Based on procedures by Timko and Moos (2002), patients were classified as high severity when they scored at least 7 on the baseline severity ratings for alcohol, drug, or both and at least 7 on the psychiatric baseline severity ratings. They were classified as moderate severity when

they scored less than 7 on the alcohol and drug and/or on the psychiatric baseline severity ratings.

Most of the 230 participants were men (96.5%). At intake, on average, participants were 45.4 years old ( $SD = 7.0$ ) and had completed 12.8 years of education ( $SD = 1.9$ ). Only 22.6% of participants were married; most were White (48.7%) or African American (47.0%) and were employed (68.7%). In the month prior to intake, the average income was US\$918 ( $SD = US\$1,716$ ).

At the time of admission, in their medical record, patients had from 1 to 4 current substance-use-related diagnoses (mean number = 1.70,  $SD = 0.77$ ). Most commonly, patients had abuse/dependence of alcohol alone (33%); alcohol and cocaine (20%); cocaine alone (10%); or alcohol, cocaine, and cannabis (8%). Also at the time of admission, patients had from 1 to 3 current psychiatric diagnoses ( $M = 1.08$ ,  $SD = 0.28$ ). The most common were major depression (19%), bipolar (16%), posttraumatic stress disorder (11%) or another anxiety disorder (11%), schizophrenia (8%), and dysthymia (8%). On average, patients had been treated (inpatient, residential, and/or outpatient) 2.8 ( $SD = 3.8$ ) previous times for substance abuse problems and 4.6 ( $SD = 8.1$ ) times for psychiatric problems.

### 2.3. Follow-up assessments

Patients were assessed at program discharge (98% follow-up rate) and at 4 months (90%) and 1 year (80%) postadmission. They were interviewed using the ASI at each follow-up, yielding composite scores in each of the three problem areas. The composite scores are produced from sets of items that are standardized and summed (McLellan et al., 1992). They range from 0 to 1. There were no significant differences on baseline demographic characteristics and ASI composite scores between patients who were and who were not followed.

We used the ASI composite score data to construct a dual-disorder problem score at intake and at each follow-up. To obtain this score, we averaged the alcohol and drug composites and added the average to the psychiatric composite (Timko, Chen, Sempel, & Barnett, in press).

### 2.4. Utilization of health services

#### 2.4.1. Length of index stay

We refer to the patient's stay in the residential program as the index stay. At discharge, the number of days each patient stayed in the residential program was assessed from the patient's chart and used to create the utilization variable *length of index stay*.

#### 2.4.2. Length of follow-up stays

At 1-year follow-up, the number of days patients stayed in inpatient or residential programs since discharge from the index stay was assessed. The VA Patient Treatment File was

used to assess the number of days patients stayed in VA specialized mental health (i.e., substance abuse or psychiatric) and medical care programs.

Information about use of non-VA health care services during the follow-up period was obtained from patients at 4-, 8-, and 12-month follow-up interviews. At discharge from the index stay, patients were given a health utilization diary in which to record any such care received. In each follow-up interview, patients were asked whether they were treated in a non-VA hospital or community residential setting for alcohol or drug problems, emotional or mental health problems, or a medical condition during the specified period; if so, they were asked the number of days for each time they were so treated, as well as for the name and location of the facility. We verified hospital and community residential admissions by contacting the facility.

We tabulated the number of days the patient stayed in VA and non-VA inpatient/residential mental health care to indicate the *length of mental health follow-up stays* and the number of days in medical care to indicate the *length of medical follow-up stays*. *Total index* and *follow-up stays* is the number of days the patient used inpatient or residential services for specialty mental health and medical care over the index and follow-up periods.

#### 2.4.3. Outpatient care

The VA National Patient Care Database was used to assess VA outpatient utilization between discharge from the index stay and the 1-year follow-up. Specialized mental health care was distinguished from medical care. Regarding non-VA outpatient services, at each follow-up interview, patients were asked if they had received outpatient treatment during the specified period for substance use, psychological, or medical problems, and if so, how many visits they had. Patients were asked to refer to their diaries when providing this information. We combined VA and non-VA outpatient utilization to measure the number of *mental health follow-up visits* and the number of *medical follow-up visits*. *Total visits* is the number of outpatient visits the patient had for mental health and medical care over the follow-up period.

### 2.5. Cost of health services

#### 2.5.1. Cost of index stay

We estimated the cost of care from the perspective of the health care sponsor, VA. For VA programs, the cost of the index stay was estimated using microcosting methods. The director of each program provided the number of occupied beds as well as the number of full-time equivalent employees for each type of staff (e.g., certified addiction therapist, psychiatrist, and vocational or practical nurse). Average salaries from the VA Financial Management System were used to estimate staff costs in each program. The annual staffing cost was divided by 365 to determine the staffing cost per day; staffing cost per day was divided

by the average number of occupied beds during the year to obtain staff cost per patient per day. Based on VA data, we added US\$14/day for patient meals. Then, to account for overhead costs (e.g., space, administrative support, utilities), we added 70% of the daily staffing plus meals costs (70% is the national average ratio of overhead to direct cost for VA residential mental health treatment; Barnett, 2003). The total daily cost was multiplied by the patient's length of stay to obtain the cost of an index VA residential stay.

For community residential programs, we surveyed the director of each program to obtain the per diem contract rate for veteran patients. To this, we added 25% to represent the VA cost of administering contracted community care programs. The overall daily cost was multiplied by the patient's length of stay to obtain the cost of the index stay for each community program.

### 2.5.2. Cost of mental health follow-up stays

To estimate the daily cost of VA mental health (i.e., substance abuse, psychiatric) inpatient/residential stays during the follow-up period, we used the median daily cost found by the VA Health Economics Resource Center (HERC; Wagner, Chen, Yu, & Barnett, 2003). Substance abuse care cost US\$418 per day, and psychiatric care cost US\$744 per day. We estimated the daily cost of non-VA inpatient and residential care using the VA rate for comparable care. For each type of stay, the daily cost was multiplied by the patient's length of stay to obtain the total cost.

### 2.5.3. Cost of medical follow-up stays

We found the daily cost of acute VA medical hospital stays using the HERC average cost method (Wagner et al., 2003). This method assigns costs based on the acuity of the condition, as represented by the Diagnosis Related Group (DRG). For non-VA medical care, because we did not know the DRG, we used the mean daily cost of VA acute medical care. Daily cost was multiplied by length of stay to obtain total cost.

### 2.5.4. Cost of mental health and medical follow-up visits

To assign the cost of patients' VA mental health and medical visits during the follow-up period, we used a microcosting method. This method matched Common Procedure Terminology codes with Medicare payment rates and aggregated VA budget data to estimate the cost of every VA outpatient visit (Phibbs, Bhandari, Yu, & Barnett, 2003). The costs of non-VA mental health and medical visits were estimated as the mean costs of comparable VA visits. Cost per visit was multiplied by number of visits to calculate total cost.

### 2.5.5. Total cost of outpatient visits

The total cost of outpatient visits was the total cost of VA and non-VA mental health and medical follow-up visits.

### 2.5.6. Total health services cost

Total health services costs included the total cost of index and follow-up inpatient/residential stays for mental health and medical care plus the cost of all outpatient visits.

## 2.6. Analyses

We estimated regressions to find the effect of patient severity and service intensity on substance use and psychiatric outcomes, health care utilization, and costs. Independent variables included an indicator of being in one of four mutually exclusive groups: high-severity patients in high-intensity programs, high-severity patients in low-intensity programs, and moderate-severity patients in high-intensity programs, with moderate-severity patients in low-intensity programs acting as the referent. We dichotomized patient severity and program service intensity rather than entering continuous measures of each variable to retain clinically meaningful patient groups. Although dichotomization may result in some loss of information about individual differences within the groups, dichotomization was justified in that previous studies supported the methods by which the groups were formed (MacCallum, Zhang, Preacher, & Rucker, 2002). Preliminary analyses showed that consideration of treatment program site had very little influence on associations of patient-treatment matching with the dependent variables; therefore, treatment program site was dropped from analyses. To control for differences in case mix, we included baseline alcohol, drug, and psychiatric ASI composite scores as independent variables in all regressions. This control was needed because participants were not randomized to programs of different service intensities.

We estimated four regressions with ASI alcohol, drug, psychiatric, and dual-problem scores as the dependent variables. These regressions were estimated using observations from the discharge and 4- and 12-month assessments. Independent variables included a dichotomous variable to indicate if the observation was from the 4-month follow-up and another to indicate if it was from the 12-month follow-up. Discharge observations were left as the reference group. A random effects regression was employed so that estimates of statistical significance were adjusted for any correlation of regression errors within patient.

We estimated ordinary least squares (OLS) regressions using total health care utilization and cost incurred over the year of the study as dependent variables. Additional OLS regressions were estimated with days of inpatient/residential care, outpatient visits, and cost subtotals as dependent variables. Specifically, dependent variables were the following groupings of care: index stay, mental health follow-up stays, medical follow-up stays, all inpatient and residential stays, mental health follow-up visits, medical follow-up visits, and total visits.

We used our regression models to predict ASI scores and health care utilization and costs of a patient with the

average ASI scores at intake (i.e., we used the fitted regression value of a patient with the mean intake characteristics). We created four sets of predicted values: those for high-severity patients in high- or low-intensity treatment and those for moderate-severity patients in high- or low-intensity treatment. For each outcome, utilization, and cost variable, we tested whether the groups were statistically different using the variance–covariance matrix from the regressions. We used SAS software to conduct the OLS regression analyses and Stata software to conduct the random effects regressions.

### 3. Results

#### 3.1. Matching patients' symptom severity to treatment intensity

##### 3.1.1. ASI composites

Table 1 reports the ASI composite and dual-problem scores at 1 year, by patient severity and program intensity. Lower ASI composite scores indicate less severe problems. The table shows that high-severity patients in high service-intensity programs had better outcomes than did high-severity patients in low service-intensity programs in each domain: alcohol use, drug use, psychiatric functioning, and the dual-problem score. This supports the hypothesis that matching high-severity patients to high-intensity treatment results in better outcomes. Moderate-severity patients' outcomes did not differ according to whether they were treated in low or high service-intensity programs except that, contrary to expectation, they had poorer drug use outcomes when they were treated in low service-intensity programs.

##### 3.1.2. Health services utilization

Table 2 shows that high-severity patients in high-intensity programs had a longer index stay than did high-severity patients in low-intensity programs. In addition, high-severity patients in high-intensity programs had

Table 2

Health services utilization over 1 year of four patient-severity by service-intensity groups, controlling for patient case mix

Health utilization	High-severity patients		Moderate-severity patients	
	High intensity ( <i>n</i> = 63), mean	Low intensity ( <i>n</i> = 35), mean	High intensity ( <i>n</i> = 47), mean	Low intensity ( <i>n</i> = 85), mean
Inpatient/residential care (days)				
Index stay	43.2 <sup>AB</sup>	23.2 <sup>A</sup>	35.3	29.1 <sup>B</sup>
Mental health follow-up stays	59.5 <sup>AB</sup>	13.4 <sup>AC</sup>	53.8 <sup>CD</sup>	18.2 <sup>BD</sup>
Medical follow-up stays	12.7 <sup>A</sup>	12.1	4.0 <sup>A</sup>	9.0
Total index and follow-up stays	115.3 <sup>AB</sup>	48.7 <sup>AC</sup>	93.1 <sup>CD</sup>	56.2 <sup>BD</sup>
Outpatient care (visits)				
Mental health follow-up visits	122.4 <sup>AB</sup>	47.7 <sup>ACD</sup>	91.1 <sup>C</sup>	83.3 <sup>BD</sup>
Medical follow-up visits	23.5 <sup>A</sup>	28.5 <sup>B</sup>	29.6 <sup>C</sup>	43.7 <sup>ABC</sup>
Total visits	145.9 <sup>A</sup>	76.2 <sup>AB</sup>	120.7	127.0 <sup>B</sup>

Note. Means in the same row that share a superscript are significantly different ( $p < .05$ ).

longer stays in inpatient/residential mental health settings subsequent to discharge. Accordingly, high-severity patients in high-intensity programs had more total days of care when the index and follow-up stays were combined. High-severity patients in high-intensity programs also had more outpatient mental health and total follow-up visits than did high-severity patients in low-intensity programs.

Moderate-severity patients in high-intensity programs had longer mental health follow-up stays and more total days of inpatient/residential care than did moderate-severity patients in low-intensity programs. Moderate-severity patients in high-intensity programs also had fewer medical follow-up visits. Otherwise, moderate-severity patients had comparable use of health services whether their index stay was in a high- or low-intensity program.

##### 3.1.3. Health care costs

Table 3 shows that high-severity patients' index stays (i.e., their initial inpatient/residential treatment) in high-intensity programs were not significantly more costly than were high-severity patients' index stays in low-intensity programs. However, high-severity/high-intensity patients' follow-up stays for substance abuse or psychiatric care were considerably more costly than were the follow-up stays in mental health settings for high-severity patients in low-intensity programs. Similarly, high-severity patients in high-intensity programs had more costly mental health outpatient care than did high-severity patients in low-intensity programs. Medical costs were comparable between high-severity patients treated in high- and low-intensity programs, but total outpatient visit costs and

Table 1

One-year ASI composite scores of four patient-severity by service-intensity groups, controlling for patient case mix

ASI composites	High-severity patients		Moderate-severity patients	
	High intensity ( <i>n</i> = 63), mean	Low intensity ( <i>n</i> = 35), mean	High intensity ( <i>n</i> = 47), mean	Low intensity ( <i>n</i> = 85), mean
Alcohol	0.209 <sup>AB</sup>	0.332 <sup>AC</sup>	0.235 <sup>C</sup>	0.279 <sup>B</sup>
Drug	0.086 <sup>A</sup>	0.137 <sup>ABC</sup>	0.071 <sup>BD</sup>	0.108 <sup>CD</sup>
Psychiatric	0.379 <sup>A</sup>	0.483 <sup>AB</sup>	0.391 <sup>B</sup>	0.436
Dual-problem score	0.527 <sup>AB</sup>	0.719 <sup>AC</sup>	0.544 <sup>C</sup>	0.629 <sup>B</sup>

Note. Means in the same row that share a superscript are significantly different ( $p < .05$ ).

Table 3  
Health care costs (in US\$) over 1 year of four patient-severity by service-intensity groups, controlling for patient case mix

Costs	High-severity patients		Moderate-severity patients	
	High intensity ( <i>n</i> = 63), mean	Low intensity ( <i>n</i> = 35), mean	High intensity ( <i>n</i> = 47), mean	Low intensity ( <i>n</i> = 85), mean
<b>Inpatient/residential care</b>				
Index stay	5,549 <sup>A</sup>	4,873 <sup>BC</sup>	6,512 <sup>BD</sup>	2,914 <sup>ACD</sup>
Mental health follow-up stays	17,915 <sup>ABC</sup>	5,243 <sup>A</sup>	7,867 <sup>B</sup>	5,871 <sup>C</sup>
Medical follow-up stays	2,468	4,018	1,375	3,504
Total index and follow-up stays	25,932	14,135	15,755	12,290
<b>Outpatient care</b>				
Mental health follow-up visits	8,361 <sup>ABC</sup>	3,129 <sup>ADE</sup>	5,316 <sup>BD</sup>	5,655 <sup>CE</sup>
Medical follow-up visits	4,534	6,429	3,066 <sup>A</sup>	6,144 <sup>A</sup>
Total visits	10,428 <sup>AB</sup>	5,541 <sup>A</sup>	7,006 <sup>B</sup>	8,295
Total health care	36,359 <sup>ABC</sup>	19,676 <sup>A</sup>	22,762 <sup>B</sup>	20,585 <sup>C</sup>

Note. Means in the same row that share a superscript are significantly different ( $p < .05$ ).

total health care costs over the year were higher for high-severity patients treated in high- rather than low-intensity programs.

The index stay of high-severity patients was just 19% more costly when they were in high-intensity programs; this was true, although their length of stay was 82% longer than that of high-severity patients treated in low-intensity programs. This difference was attributable to differences in setting. The high-severity patients who were treated in high-intensity programs received 31% of their index care from community residential facilities, which had a lower cost per day of stay. High-severity patients treated in low-intensity programs received just 4% of their care from these low-cost facilities.

Moderate-severity patients treated in high-intensity programs had more costly index stays than did moderate-severity patients in low-intensity programs, which is consistent with expectations. Moderate-severity patients had comparable mental health follow-up care costs—both inpatient/residential and outpatient—whether they were treated in low- or high-intensity programs. Moderate-severity patients treated in high-intensity programs had lower outpatient medical visit costs over the follow-up year, but medical follow-up stay, total outpatient visit, and total health care costs did not differ between moderate-severity patients treated in high- or low-intensity programs.

We conducted sensitivity analyses to see if the statistical significance of our results was affected by our use of methods that relied on the assumption of a normal distribution. To evaluate the results of outcomes reported in Table 1, we calculated the difference in scores in each

ASI domain between baseline and the 1-year follow-up and used nonparametric tests to compare differences between groups. For each outcome, we used a Kruskal–Wallis test to evaluate whether there was any significant group difference, and if so, we used the Wilcoxon Rank Sum Test (with multiple test correction) to make post hoc comparisons. Results were very similar to the findings presented in Table 1. High-severity patients had significantly better outcomes in high-intensity programs, but there was no evidence that moderate-severity patients did better in low-intensity programs.

To evaluate the utilization and cost results reported in Tables 2 and 3, we conducted additional regressions using the log of the dependent variables. The significance of total outpatient visits and total cost was unchanged by this alternate specification. Among high-severity patients, all significant differences based on treatment intensity remained significant, with the exception of the cost of mental health follow-up visits. Among moderate-severity patients, all significant differences based on treatment intensity remained significant, with the exception of days of mental health follow-up stays, the total days of follow-up stays, and the cost of medical follow-up visits.

#### 4. Discussion

Compared with high-severity patients in low service-intensity programs, high-severity patients in high service-intensity programs had better substance use and psychiatric outcomes. However, unexpectedly, the high-severity/high service-intensity group also had higher mental health care costs—both inpatient/residential and outpatient—during the follow-up period. Moderate-severity patients' outcomes and health care costs generally were comparable whether they were treated in low or high service-intensity programs.

##### 4.1. Matching patients' symptom severity to treatment intensity

As we hypothesized, high-severity patients who were treated in high service-intensity programs had better alcohol use, drug use, psychiatric, and dual-problem 1-year outcomes than did high-severity patients who were treated in low service-intensity programs. Also as expected, on the whole, moderate-severity patients did not differ on 1-year outcomes according to whether they were treated in low or high service-intensity programs. The exception was that moderate-severity patients had poorer drug use outcomes when they were treated in low rather than high service-intensity programs. These results support others' conclusions that dual-diagnosis patients who have more disabling psychiatric disorders require and should be targeted for more extensive services such as additional psychotherapy or pharmacotherapy (Curran, Kirchner, Worley, Rookey, & Booth, 2002; Goethe, Fisher, & Dornelas, 1997).

#### 4.1.1. High-severity patients' use and costs of services

The better outcomes of high-severity patients in high service-intensity programs were likely due to the enhanced psychiatric, substance abuse, counseling, rehabilitation, and social-recreational services offered during acute treatment. It will be important in future research to examine which of these enhanced services were most strongly associated with improved outcomes and which had weaker associations, so that costs of providing peripheral services can be eliminated even in high-intensity programs. The better outcomes of high-severity patients in high-intensity programs were possibly also due to the longer stays these patients had during the index episode of care and the greater amounts of treatment they received during the postdischarge follow-up period. Specifically, we found that high-severity patients in high service-intensity programs had longer index stays than did high-severity patients in low service-intensity programs.

In addition to differences in the index stay, high-severity patients in high service-intensity programs had longer inpatient/residential mental health care stays following discharge from acute care. Other studies examining predictors of mental health care utilization similarly found that patients with more and longer stays in mental health inpatient or residential programs had more subsequent admissions and longer stays in mental health treatment facilities (Goethe, Dornelas, & Gruman, 1999; Hopko, Lachar, Bailley, & Varner, 2001; Walker, Minor-Schorck, Bloch, & Esinhart, 1996). These studies also found that the success of the inpatient/residential intervention in terms of patients' outcomes had little influence on the likelihood of readmission (Bauer, Shea, McBride, & Gavin, 1997; Lyons et al., 1997). In fact, a history of seeking treatment predicted outpatient psychiatric utilization better than did current clinical need (Friedman & West, 1987).

High-severity patients in high service-intensity programs also had more outpatient visits for mental health problems over the post-acute care period, as compared with high-severity patients in low-intensity programs. Other studies have found associations of use of mental health inpatient treatment with high amounts of mental health ambulatory care services use (Huff, 2000). Booth, Cook, Blow, and Bunn (1992) found that use of mental health outpatient services was substantially higher for patients with extended inpatient substance abuse treatment compared with those with brief hospitalizations for detoxification. They suggested that motivation was elevated among extended care patients.

Contrary to expectation, high-severity patients in high service-intensity programs had more costly mental health inpatient/residential follow-up stays than did such patients in low service-intensity programs. High-severity patients in high service-intensity programs also had more costly mental health outpatient visits than did such patients in low service-intensity programs. Possibly, these findings can be viewed positively in light of similar results by Hayes et al. (2003), who also found that an increased intensity of services to

dual-diagnosis patients was associated with patients remaining engaged in treatment for longer periods. Hayes et al. interpreted their results as representing a system improvement in that increased service utilization afforded the patient more opportunity to achieve gains in adaptive functioning.

Despite the possible benefits of patients' continued system engagement, research is needed to help mental health system planners identify solutions to the pattern that higher intensity or more treatment is associated with continued high amounts of costly health care utilization among patients with high illness severity. One idea is to create networks of providers to enable frequent users of acute care facilities to return to the same facility that previously discharged them (Geller, Fisher, McDermeit, & Brown, 1998); this would reduce length of stay by obviating the need for patients, family members, and providers to start anew in the facility with each episode of treatment. Another idea is to have a stronger treatment focus on improving patients' illness management skills. These skills, distinguished from disorder severity, involve the individual's ability to cope with illness and engage in treatment and are potentially modifiable in such a way as to reduce the utilization of mental health services (Bauer & McBride, 1996).

#### 4.1.2. Moderate-severity patients' use and costs of services

We found, as expected, that moderate-severity patients treated in high service-intensity programs had more days of follow-up mental health care than did moderate-severity patients whose index stay was in a low-intensity program. However, moderate-severity patients treated in high or low service-intensity programs had comparable mental health follow-up costs in both the inpatient/residential and outpatient systems. Moderate-severity patients in low-intensity programs had more outpatient medical follow-up visits. Although this finding suggests that moderate-severity patients' medical needs were not met during the low-intensity index stay, and were therefore addressed in subsequent outpatient care, it is puzzling why this suggestion does not hold for high-severity patients in low-intensity programs, who did not have such high numbers of outpatient medical follow-up visits. A speculative explanation is that better functioning patients who received low-intensity care were more able than their poorly functioning counterparts to seek, be engaged in, and adhere to recommendations of medical care they needed.

#### 4.2. Cost-effectiveness

Dual-diagnosis patients with highly severe symptoms had better substance use and psychiatric outcomes and higher health care costs when they were treated in high service-intensity programs than in low service-intensity programs. Specifically, high-severity patients had an ASI dual-problem score at the 1-year follow-up that was 0.192 lower and incurred an average of US\$16,683 additional health care costs over the study year when they were treated

in high-intensity programs. On the whole, moderate-severity patients had comparable 1-year outcomes and costs when they were treated in high or low service-intensity programs. However, more specifically, in comparison with moderate-severity patients treated in low service-intensity programs, moderately ill patients in high-intensity programs had better drug abuse outcomes at 1 year (i.e., a score that was 0.037 lower) and a more costly index stay (i.e., a cost that was US\$3,598 higher).

Although high-intensity programs yielded better outcomes, it is uncertain whether high-intensity treatment is a cost-effective use of health care resources. Currently, health care planners have no standard by which to evaluate whether the improvement in outcomes is sufficiently valuable to justify the extra cost of care. The dominance principle of cost-effectiveness analysis favors a treatment alternative that improves outcomes and reduces total costs. This principle has been applied to many substance abuse treatment studies but is not helpful in this case in which a treatment resulted in better outcomes but higher costs.

When one intervention yields better outcomes at a higher cost, it is possible to calculate a cost-effectiveness ratio. This ratio is the change in outcomes divided by the change in cost. It represents the cost of achieving an additional unit of improvement in outcomes. Among high-severity patients, high-intensity care added US\$16,683 in cost and reduced the combined index of substance use and psychiatric problems by 0.192. It thus cost US\$8,689 for each 0.1 improvement in the combined problem score.

For moderate-severity patients, high-intensity care was more costly but did not yield significant improvement. High-intensity care added US\$3,465 in cost and reduced the problem index by 0.085. Although we can calculate a cost-effectiveness ratio of US\$4,076 for each 0.1 improvement in the combined problem score, there is a broad confidence interval about this ratio, as the difference in outcomes was not statistically significant. When a particular treatment improves an outcome and adds costs, decision makers must decide if the value of the outcome justifies its costs; that is, they must have a threshold to judge where the cost-effectiveness ratio is sufficiently low to justify adoption of the treatment. One approach is to assign a dollar value to outcomes, as was done in studies of whether substance abuse treatment is a good use of public funds (Gerstein et al., 1994; Harwood, Hubbard, Collins, & Rachal, 1995). However, medical care decision makers are hesitant to assign monetary values to treatment outcomes because assigned values may be higher for wealthier patients, which poses ethical questions about health care equity. Because this approach is rarely used in economic evaluations of medical care, there is no commonly accepted threshold for what ratio of benefit to cost justifies adoption of a treatment.

Guidelines for cost-effectiveness analysis that were developed by a task force of the U.S. Public Health Service (Gold, Siegel, Russell, & Weinstein, 1996) recommended that outcomes be expressed using a standard measure, the

Quality-Adjusted Life Year, which represents both the quantity and quality of life (Torrance & Feeny, 1989). There is an extensive literature using this method, but it has been applied only rarely to the study of psychiatric (Evers, Van Wijk, & Ament, 1997) or substance abuse (Barnett, 1999) treatments. A key problem that has hindered the economic evaluation of mental health treatment is the lack of methods to make adjustments to reflect the impact of patients' disorders on quality of life.

Cost-benefit studies have estimated the effect of substance abuse treatment on patient earnings and the costs of health services, social welfare, incarceration, and criminal activities. A review of 18 cost-benefit studies found consistent evidence that the benefits of drug treatment exceed its costs (Cartwright, 2000). Avoided criminal activity accounted for more than half of the estimated benefits in almost all cost-benefit studies of drug abuse treatment (McCollister & French, 2003). These measures of societal costs used in cost-benefit studies may not be significantly correlated with the clinical objectives of treatment, however (Dismuke et al., 2004). As a result, the cost-benefit method may not be very well suited to economic evaluations of alternative treatments. Cost-benefit analysts have not yet established the monetary value for the improvement in quality of life that comes from reduced substance use. A first step has been taken by estimating the economic benefit of avoiding infectious diseases caused by drug abuse (French, Manskopf, Teague, & Roland, 1996).

#### 4.3. Limitations

The findings must be considered in light of the fact that, although study participants were spread throughout the United States, all of them were treated in programs that accepted veteran patients. Studies comparing mental health care within and outside the VA suggest that VA-based findings may generalize somewhat better to nonprofit than to for-profit settings, although all three systems share similarities (Calsyn, Saxo, Blaes, & Lee-Meyer, 1990; Rodgers & Barnett, 2000). Generally, mental health services in the VA are of similar quality and effectiveness to those in the private sector (Rosenheck, Desai, Steinwachs, & Lehman, 2000). However, the VA patient population has poorer health status compared with the general patient population (Agha, Lofgren, VanRuiswyk, & Layde, 2000). The extent to which our findings will be replicated in studies of patients with more health and social resources and in other health care systems remains to be determined. Also to be examined is the extent to which our findings will be replicated when different methods are used to classify dually diagnosed patients' symptom severity. For example, future studies might use the Functional Assessment Interview (Mueser, Noordsy, Drake, & Fox, 2003), which, unlike the ASI severity ratings used in this study, includes additional assessment information collected from family and friends, treatment providers, and medical records.

In this study, individuals were not randomly assigned to acute care programs of different service intensity. Thus, in part, the benefits we identified reflect the influence of selection and motivational factors. The naturalistic longitudinal design precludes firm inferences about the causal role of service intensity in producing better outcomes, but our findings probably indicate the real-world effectiveness of dual-diagnosis patients receiving high service-intensity acute care.

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