RESEARCH REPORT

An Intensive Outpatient Approach for Cocaine Abuse Treatment

The Matrix Model

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Abstract—The Matrix model of outpatient treatment was developed during the 1980s in response to an overwhelming demand for cocaine abuse treatment services. The model was constructed using components based upon empirically supported findings from the substance abuse research field. Over the course of development, data were collected on the treatment model and the model was modified based upon empirical evaluation. A pilot study comparing the Matrix outpatient model with an inpatient hospital treatment program produced preliminary support for the clinical utility of the model. An open trial comparing publicly and privately funded patients demonstrated that patients with fewer resources were more difficult to engage and retain in this model of outpatient treatment. In a controlled trial, a clear positive relationship was documented between duration and amount of treatment involvement in the Matrix model and positive outcome at 1 year. Due to a variety of methodological issues, the study was not able to answer definitively the question of clinical efficacy. In all of these studies, patients treated with the Matrix model demonstrated statistically significant reductions in drug and alcohol use and improvements in psychological indicators. This body of work, along with the public acceptance the model has received in the treatment community, support the usefulness of this intensive outpatient approach for cocaine abuse. Further research is underway to provide additional controlled information on the value of this treatment approach.

Keywords—Matrix model; cocaine abusers; treatment services.

Cocaine abusers in the 1980s created a huge demand for treatment services. Initially, however, there were neither adequate resources available to fund treatment, and there were no appropriate treatment modalities for addressing their problems. The private system mobilized quickly and created treatment programs by adapting alcoholism programs to treat cocaine abusers or created novel treatment approaches. Hospitals launched advertising campaigns to publicize 28-day inpatient cocaine treatment programs based on the Minnesota Model of alcoholism treatment. At the same time,
novel programs emerged that featured treatments with amino acids, acupuncture, neuroelectric stimulation, hydrotherapy, and a wide range of counseling approaches. Within a period of less than 5 years, the private cocaine abuse treatment system grew from a nonexistent entity to a booming industry (Rawson, 1991).

In the public sector, the system mobilized much more slowly. The response to public sector needs was research on medications and a NIDA-supported program of research to develop outpatient psychosocial interventions for treating cocaine abuse. Among the first pilot studies for treating cocaine dependence were evaluations of tricyclic antidepressants, primarily desipramine (Gawin & Kleber, 1984; Tennant & Rawson, 1983) and imipramine (Rosecan, 1984). By the early 1990s, there was a high level of enthusiasm and effort expended to discover medications that would demonstrate efficacy in treating cocaine abusers. However, to date there are few pharmaceutical compounds that have demonstrated efficacy.

OUTPATIENT COCAINE TREATMENT APPROACHES

Studies of psychosocial cocaine treatment interventions using controlled clinical trials have yielded promising findings. An initial trial with contingency contracting techniques produced positive results (Anker & Crowley, 1984). O'Brien, Childress, McLellan, and Ehrman (1990) demonstrated the benefit of a cue exposure procedure in promoting extinction of conditioned responses to cocaine-related stimuli. The Yale group documented the superiority of relapse prevention strategies over interpersonal psychotherapy techniques in terms of treatment retention and reduced drug use (Carroll, Rounsaville, & Gawin, 1991). Hoffman and associates reported that subjects assigned to a minimal relapse prevention condition (90-min groups twice weekly without additional psychotherapy) were significantly more likely to terminate treatment prematurely than subjects in more intensive conditions that combined relapse prevention and psychotherapy (Hoffman, Caudill, & Koman, 1993). Their study provided strong evidence that there is an optimal treatment dose for retaining cocaine-abusing subjects in outpatient drug treatment. The finding was supported by Kang et al. (1991), who reported that weekly outpatient therapy was ineffective in retaining subjects in treatment or in initiating or sustaining abstinence from cocaine.

The most well-designed and experimentally definitive demonstration of any treatment approach for cocaine abuse is represented by the work of Higgins and associates (Higgins et al., 1991; Higgins et al., 1993). In these reports, a set of behaviorally based procedures called the community reinforcement approach clearly demonstrated efficacy both in retaining cocaine abusers in treatment and in reducing subjects' cocaine use when compared to a standard counseling approach. These studies provided an extremely robust treatment effect, which solidly established the efficacy of the procedure.

Higgins and associates have followed a well-established strategy for documenting the empirical utility for their method. They constructed a package of techniques based upon solid scientifically established principles, tested it in pilot trials, and validated its empirical efficacy in controlled trials using random assignment. Their development of the community reinforcement approach has demonstrated an excellent example of how a treatment method can be empirically established. The hope now is that the continued research on and exposure given to this procedure will result in its implementation into the real world treatment system. This process of empirical validation of a method followed by the dissemination into the treatment system is how the areas of clinical research and treatment are ideally supposed to interface.

THE MATRIX MODEL

The well-staged sequence of treatment development demonstrated by Higgins and his colleagues in the establishment of their behaviorally based package is not always an option as treatment demands, research timetables, and funding realities collide. For example, the therapeutic community model of treatment was established in the late 1950s, and this model of treatment was extensively used years before any outcome data supported its efficacy. Empirical support for the model came well after the approach had gained widespread acceptance and utilization. The same sequence occurred with the 28-day Minnesota Model of hospital-based alcoholism treatment. Only after 20 years as the de facto treatment standard were data collected to support this form of treatment (Walsh et al., 1991).

The genesis of the Matrix model was during the early 1980s when the first wave of cocaine abusers began to seek help. The group at the Matrix Center in Southern California developed a structured psychosocial protocol and began to evaluate its value for treating cocaine abusers (Rawson, Obert, McCann, & Mann, 1985). Initial work with this set of techniques referred to the method as the neurobehavioral model. The name has been changed to correspond with the name of the organization responsible for this work. The model was created as the authors delivered treatment to cocaine abusers seeking treatment while conducting a program of evaluation. The intent was to make the model responsive to the needs of substance-abusing patients while constructing a replicable protocol that could be evaluated. This approach attempted...
to combine clinical integrity and empirical validation into a process that would guide an empirically supported model into the treatment system.

The sequenced treatment materials have evolved from applying concepts described in theoretical and applied research to the needs of cocaine abusers attempting to stop cocaine use. Treatment materials drew heavily upon published literature pertaining to the areas of relapse prevention, family and group therapies, drug education, and drug abuse monitoring. The clinical material integrated into the treatment manual has been selected as a result of a behavioral analysis of the types of problems encountered by cocaine abusers as they proceeded through a period of cocaine abstinence. Over 3,500 cocaine users have been treated with the method. The experience of these patients has been the source of the data used in developing and modifying the model.

**PROGRAM FORMAT**

The goal of the Matrix model has been to provide a framework within which cocaine abusers can achieve the following: (a) cease drug use, (b) remain in a treatment process for 12 months, (c) learn about issues critical to addiction and relapse, (d) receive direction and support from a trained therapist, (e) receive education for family members affected by the addiction, (f) become familiar with the self-help programs, and (g) receive monitoring by urine testing. The schedule of program activities is delineated in Figure 1.

**Individual Sessions**

The Matrix model places an intense focus on the use of individual sessions with a professional therapist serving as the primary treatment agent. Therapists are

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### PHASE I (MONTHS 1-6)

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<tr>
<td>Friday</td>
<td>Stabilization Group</td>
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<tr>
<td>Weekly</td>
<td>2 Individual/Conjoint Sessions</td>
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<tr>
<td>Weekly</td>
<td>Breath Alcohol/Urine Test</td>
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<tr>
<td>Weekly</td>
<td>Twelve-step Meeting On-site</td>
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<tr>
<td>Weekly</td>
<td>Individual/Conjoint Session</td>
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<tr>
<td>Weekly</td>
<td>Breath Alcohol/Urine Test</td>
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<td>Weekly</td>
<td>Twelve-step Meeting On-site</td>
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</table>

### PHASE II (MONTHS 7-12)

All clients attend the weekly Support Group for an additional 6 months. Individual/Couples therapy and breath alcohol testing are also available. Ongoing involvement in twelve-step activities continues.

**FIGURE 1.** The material in this manual is designed to be used according to the following schedule. These activities are designed to be used together with involvement in a 12-step program.
trained master's degree counselors who have received 120 hr of specialized training at the Matrix Center before they are assigned caseloads. The approach to working with patients requires that therapists use a combination of skills required to function simultaneously as teacher and coach. The therapist fosters a positive, healthy relationship with the patient and uses that relationship to reinforce positive behavior change. The interaction is realistic and direct but not confrontational or parental. Therapists are trained to view the treatment process as an exercise that will promote self-esteem, dignity, and self-worth. A positive relationship between patient and therapist is a critical element for patient retention.

The content of the 45-min individual sessions is structured to include specific information and a set of exercises. In the early stages of development of this model, there were 52 individual sessions; however, since 1990 there are 20 individual sessions scheduled in the first 6 months of intensive involvement. The sequence of sessions is structured to present information in an order that corresponds with the timetable of issues often experienced by the patients in the recovery process, although there is flexibility for attending to individual patient issues.

**Educational Group**

The 16-week educational group is presented to patients and their families in a classroom setting. The educational component includes such program topics as these: (a) the biology of addiction, describing concepts such as neurotransmitters, brain structure and function, and drug tolerance; (b) conditioning and addiction, including concepts such as conditioned cues, extinction, and conditioned abstinence; (c) medical effects of stimulants on the heart, lungs, reproductive system, and brain; and (d) addiction and the family, describing how relationships are affected during addiction and recovery. Twelve other topics are covered for a total of 16 lectures.

**Stabilization Group**

The stabilization group is a group conducted on Friday nights. Patients participate for the first 2 weeks of treatment. The topics covered in this group contain the skills needed for staying sober through the following weekend. This is typically a small group that is very directed. It provides a nonthreatening introduction to group situations for people who are unfamiliar with groups.

**Relapse Prevention Group**

The relapse prevention group is a central component of the Matrix treatment package. This group has a specific purpose and a specific format. The group provides a setting in which information about relapse and relapse prevention can be shared. Signs of impending relapse can be identified by staff and patients. Patients heading toward relapse can be redirected, and those who are on a sound course of recovery can be reinforced. The group setting allows for mutual patient assistance within the guiding constraints of a professional therapist and recovering addict co-leader. A set of 40 relapse prevention exercises have been developed from concepts described in the relapse prevention literature and adapted for cocaine abusers.

**Conjoint Sessions**

During the first 6 months of the program, a minimum of seven conjoint sessions are scheduled. These typically are conducted with the patient and spouse/significant other. The material is structured to encourage communication between the patient and family member about positive areas of change, identifying problem areas, and devising strategies for dealing with problems. These sessions are helpful in defusing problem situations without initiating an intensive couples counseling process.

**Urine Tests**

Urine tests are collected randomly on a weekly basis. Positive urine tests are used as points of discussion in individual therapy sessions. They provide an indication that some aspect of the treatment plan is inadequate or incomplete. Urine tests are not used for punitive or legal monitoring purposes.

**AA Meeting**

Each of the Matrix offices has an AA meeting on the premises one night per week. These meetings are standard AA meetings, run according to the traditions of AA. Patients are strongly encouraged to participate in these meetings as part of their recovery plan.

**Relapse Analysis**

An important aspect of relapse prevention training is how to handle a relapse if one occurs. Within the Matrix model, the manner in which a relapse is handled is standardized by the use of a structured exercise. The exercise allows the therapist and the patient to understand the issues and events that occurred preceding the relapse that may provide clues for the prevention of future relapses.

**Social Support Group**

This group is designed to assist patients in establishing new nondrug-related friends and activities. The
group is used to provide patients with ongoing support into Phase 2 as a weekly recovery support group.

EVALUATION OF THE MATRIX MODEL

Pilot Study

Guided by the philosophy of developing a clinically viable, empirically supported treatment intervention, effectiveness studies began with implementation of the Matrix treatment model. In the spring of 1985, a pilot study was conducted by an independent research associate hired by Matrix Center (Rawson et al., 1985). The study documented the clinical progress of 83 cocaine abusers at 8 months following treatment admission. The goal of the study was to provide preliminary evidence regarding the effectiveness of the treatment model in treating cocaine abusers compared to either inpatient treatment or no formal treatment. During an evaluation session, subjects self-selected one of three treatment options: (a) no formal treatment (voluntary involvement in AA, CA, or NA), (b) 28-day inpatient treatment, or (c) outpatient treatment using the structured Matrix treatment model.

Analyses showed there were no demographic or drug use differences across the treatment conditions at evaluation. Results from the pilot study showed that subjects in the hospital and Matrix treatment conditions generally completed their treatment episodes (26.5 of 28 days vs. 21.6 of 26 weeks, respectively). Conversely, subjects in the no formal treatment condition rarely sought treatment after their initial evaluation interviews. Only 20% of no formal treatment subjects ever attended more than one AA, CA, or NA meeting. The noteworthy finding of this pilot study was that at 8 months post-evaluation subjects who attended Matrix outpatient treatment reported significantly lower rates of cocaine use than subjects in either the hospital or the no formal treatment conditions ($\chi^2 = 8.81, df = 2, p < .05$; see Figure 2).

Not only were these pilot data promising, they were also clinically valuable for making empirically directed revisions of the Matrix treatment model. For instance, early versions of Matrix treatment materials maintained a neutral stance on alcohol and marijuana use. Analyses from the pilot study showed that subjects from all treatment conditions were significantly more likely to return to cocaine use if they continued to drink alcohol (50% relapsed to cocaine who used alcohol vs. 6% who did not use alcohol, $\chi^2 = 14.59, df = 1, p < .01$) or smoke marijuana (59% relapsed to cocaine who used marijuana vs. 20% who did not use marijuana, $\chi^2 = 10.70, df = 1, p < .05$). On the basis of these findings, Matrix materials were altered to prescribe abstinence from all substances as a tactic for avoiding return to cocaine use.

Conclusions From the Pilot Study. Although the conclusions drawn from this pilot study were limited due to the quasi-experimental design of the study, the low numbers of subjects per cell, and the self-selection of participants to treatment condition, these data provided support that the materials and clinical strategies used in the Matrix outpatient program produced a useful experience that appeared to aid study participants in achieving cocaine abstinence. The findings also provided an initial experience in using outcome data to alter treatment materials with the goal of increasing treatment effectiveness. Based on the encouraging pilot data, the next step for documenting effectiveness was to conduct an open trial study of the model to determine whether there were systematic differences in outcomes depending on patient variables.

Open Trial Study

The Matrix model has been implemented in a standardized manner since 1985 by the Matrix Center in Southern California. In two of the six Matrix Center offices (Beverly Hills and Rancho Cucamonga), a large-scale open trial was conducted to provide a foundation for future systematic studies of the model (Rawson, Obert, McCann, & Ling, 1991). In this open trial, 486 subjects volunteered to participate in the treatment evaluation (Beverly Hills, $n = 314$; Rancho Cucamonga, $n = 172$). In the Beverly Hills office, which has a primarily middle class catchment drawn from West Los Angeles and Santa Monica, the source of funding for the treatment was patient fees or private insurance for 85% of the participants ($4,500 per episode). An additional 15% were treated pro bono. Drawing from a poorer catchment area in the Eastern Los Angeles and San Bernardino Counties, only 20% of Rancho Cucamonga subjects paid fees or used private insurance. Treatment episodes for the other 80% were paid for under a contract with San Bernardino County Department of Health Services. Treatment effectiveness for the subjects at the two sites was measured along two primary dependent variables: retention in treatment and in-treatment urinalyses results.

Reflecting differences in demography, Beverly Hills subjects were slightly older than Rancho Cucamonga subjects (30.8 vs. 27.6 years, respectively), slightly better educated (14.2 vs. 12.6 years), and had higher annual legal incomes ($27,900 vs. $16,700). Subjects were similar along other demographic variables with over one half (54%) of the subjects being single, 32% married, and the remainder (14%) divorced or separated. Across both sites the majority of subjects were Caucaisan/Anglo (76%), and 15% were African American and 8% Hispanic. Subjects' admission drug and alcohol histories were very similar. Subjects did differ on route of administration, with 51% of the Beverly Hills sample using intranasal methods, whereas
65% of Rancho Cucamonga subjects smoked crack cocaine.

Weekly urine samples were taken as part of the treatment program. Samples were screened for cocaine and amphetamine metabolites. In those cases where a subject reported cocaine use by self-report, a urine test was deferred and a positive result was recorded.

Eighty-eight percent of the samples taken or weekly self-reports in both location groups were negative for stimulants during the 6-month intensive phase of treatment. Although similar urinalyses results were seen across sites, subjects showed substantial differences in treatment retention depending on location. Specifically, Beverly Hills subjects averaged over 5 months (21.0 weeks), and Rancho Cucamonga subjects averaged over 3 months (13.2 weeks). One of the causes of the discrepancy between the two samples was that in Rancho Cucamonga, 20% of the subjects dropped out during the first 2 weeks, whereas in Beverly Hills, this early attrition rate was only 8%. Conversely, in Beverly Hills, almost one half (48%) finished the intensive 6-month phase of the program, whereas only 22% of Rancho Cucamonga subjects completed this phase of treatment.

Conclusions From the Open Trial. The data from the open trial provided some important perspectives on the use of this treatment modality with a relatively large group of cocaine abusers. First, the open trial replicated the impression from the pilot study that the Matrix treatment model was a viable treatment approach that could retain many cocaine abusers for substan-
tial treatment episodes. Findings from the open trial also provided the initial suggestion of a dose-response association; that is, there was a tentative connection between the duration of treatment engagement and drug use status through 6 months of treatment. Further, although there appeared to be a positive association between subjects' socioeconomic status and treatment retention, this association was confounded by a number of variables including route of cocaine administration, employment status, access to transportation, and the like. Overall, however, the sense from this large open trial was that the model did provide a useful framework for a broad range of cocaine abusers.

The Controlled Trial

The initial indications that the Matrix treatment model could retain cocaine abusers for significant treatment episodes and that those who remained in treatment were more likely to be abstinent were encouraging. The next step for evaluating the model involved a controlled trial with random assignment of subjects to treatment conditions. Through a funding mechanism called the Small Business Innovative Research (SBIR) Program, the protocol for the Matrix model was formalized into a 300-page treatment manual (Grant No. R43 DA05778-01; Rawson, Obert, McCann, Smith, & Scheffey, 1989). After completion of the manual, 2 years of funding were provided between 1989 and 1991 to test the efficacy of the model in a controlled clinical trial (Grant No. R43 DA05778-02).

The design for the controlled trial involved random assignment of 100 cocaine abusers either to a Matrix treatment condition or to a condition of referral to treatment at "other available community resources." There was no screening or lead-in period for this study. All cocaine abusers seeking treatment who qualified for inclusion were admitted to the study and randomly assigned to treatment condition. Subjects assigned to the community resources condition were provided with a detailed overview of the publicly and privately funded treatment alternatives in their geographic areas and were given a referral and appointment times to receive an evaluation session at their community resource clinic. Subjects assigned to the Matrix condition were introduced to their Matrix therapist and immediately initiated treatment activities according to the Matrix protocol. Subjects admitted to both conditions were scheduled for 3-, 6-, and 12-month follow-up evaluation sessions and were paid $25 for each completed follow-up. Follow-up rates at each data collection point were 100% at intake, 92% at 3 months, 87% at 6 months, and 86% at 12 months.

Three dimensions of outcome variables were measured at follow-up sessions: (a) treatment retention/program compliance, which was recorded as the total number of weeks in treatment and the number and type of treatment sessions attended per week for Matrix subjects and a self-report of number and types of treatment sessions attended between follow-up sessions for community resources subjects; (b) drug use status, as measured by urinalyses results at follow-up session for all subjects (abstinence status for Matrix subjects was also measured by weekly urinalyses results); and (c) self-report of drug use and psychosocial function as measured by a battery of techniques including the time-line follow-back self-report technique for recording drug and alcohol use, the Addiction Severity Index (ASI; McLellan, Luborsky, Woody, & O'Brien, 1985), the Profile of Mood States (POMS; McNair et al., 1978), and the Center for Epidemiologic Studies--Depression (CES-D; Radloff, 1977).

Community resources and Matrix subjects in the controlled trial were similar along most demographic variables with the average subject being a single White male, aged 31 years, with slightly more than a high school education (12.7 years). Compared to previous Matrix subjects, there was substantially more ethnic diversity among subjects, with 27% being African American, 23% Latin American, and the remainder Caucasian. The admission characteristics indicated that the controlled trial subjects were similar along most intake demographic and drug use variables to the open trial, publicly funded subjects who had been treated in the Rancho Cucamonga site discussed in the previous study.

1. Treatment Retention/Program Compliance. At 3- and 6-month follow-up interviews, 40% of the community resources subjects reported involvement in formal treatments that ranged from outpatient programs to inpatient hospital programs. Community resources group subjects did not represent a comparison condition of untreated controls. The community resources condition proved not to be a useful experimental comparison condition because of the tremendous heterogeneity of treatment experiences among community resources subjects.

Matrix subjects in the controlled trial (24%) replicated the Rancho Cucamonga open-trial subjects' 6-month program completion rate (22%). The 24% Matrix completion rate contrasted with the 48% to 60% rate among those who paid for treatment with insurance or private resources (Rawson, Obert, McCann, Castro, & Ling, 1991). These data reinforced the conclusion that retaining lower income crack smokers is more difficult than retaining intranasal cocaine users who have greater social stability and resources. Matrix subjects were better satisfied with their drug treatment than community resources subjects. Using a 5-point scale ranging from not at all helpful (1) to extremely helpful (5), Matrix subjects rated their treatment as significantly more helpful than subjects in the community
resources condition ($M_{MX} = 3.8$ vs. $M_{CR} = 2.5$; separate variance, $t = 4.04$, $df = 46.9$, $p < .001$).

2. **Drug Use Outcomes.** Both groups of subjects reported significant reductions in their cocaine use over the 12-month study period. There was a three- to seven-fold reduction in self-reported cocaine use behaviors from baseline to 12-month follow-up (see Table 1). However, analyses of follow-up urinalyses showed there were no statistically significant main effects between groups.

3. **Psychosocial Function.** Repeated measures analyses showed both groups of subjects reported significant reductions over time in addiction severity (ASI) and in mood disturbance as measured by the POMS and the CES-D. Again, however, there were no significant treatment group differences.

To determine if the changes over time were related to treatment, a post hoc analysis attempted to determine if there was a relationship between amount of treatment received and the amount of change from baseline to the 12-month point. To conduct the analysis, subjects in both conditions were categorized according to whether they received a minimal amount of treatment, a moderate amount of treatment, or a substantial amount of treatment. These categories were defined as follows:

- **Matrix subjects:** minimal treatment = 4 or fewer weeks of treatment ($n = 15$), moderate treatment = 5 to 18 weeks of treatment ($n = 19$), and substantial treatment = 19 or more weeks of treatment ($n = 16$).

- **Community resources subjects:** minimal treatment = no treatment and no 12-step groups ($n = 19$), moderate treatment = 12-step participation only ($n = 12$), and substantial treatment = formal treatment episode with or without 12-step participation ($n = 19$).

Post hoc analyses of the urinalyses data revealed a nonsignificant effect for treatment condition by treatment engagement level. However, when combined across treatment conditions, subjects who received substantial treatments were significantly more likely to have negative urinalyses results at 12-month follow-up (69% negative, 31% positive) than subjects who received moderate (33% negative, 67% positive) or minimal (28% negative, 72% positive) treatments ($\chi^2 = 11.97$, $df = 2$, $p < .01$). Further, there was a statistically significant interaction in the results such that Matrix subjects demonstrated a strong positive relationship between amount of treatment received and percent of cocaine negative urine results whereas there was no similar relationship for subjects in the community resources condition (see Figure 3).

This treatment condition by treatment participation level interaction using urine data was replicated by significant interaction effects for 12-month ASI and CES-D scores. Findings indicated that a higher level of treatment participation was significantly associated with improvement for Matrix subjects, especially for ASI employment ($F = 13.40$, $df = 1, 73$, $p < .01$) and family scales ($F = 9.13$, $df = 1, 73$, $p < .01$). This relationship did not occur with subjects in the community resources group. These post hoc associations involved nonrandom assignment of subjects into levels of treatment participation and preclude definitive statements. However, this evidence along with the clinical impressions of the staff involved, supported an interpretation of these data of an orderly dose-response association between amount of treatment and outcome status.

A final test of the dose-response association involved exploring whether there were associations between amount of treatment received (both in length of treatment and amount of treatment per week) and abstinence status at follow-up. To address this question, subjects were dichotomized into abstinent/not abstinent groups based upon urinalyses results at the three

### TABLE 1
Self-Report of Drug-Use-Related Behavior From Baseline to 12 Months

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<th>CR $^b$</th>
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<td>$M$ ($SD$)</td>
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<tr>
<td>12 months</td>
<td>2.0 (5.7)</td>
<td>2.0 (5.2)</td>
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*Note. All ratings are for the previous 30 days.*

$^a$MX = Matrix, $n = 41$.

$^b$CR = community resources, $n = 44$. 

follow-up data collection points. Abstinent subjects were defined as those with negative urinalyses results at all three follow-ups. This classification process resulted in 18 subjects who fit criteria for abstinence (community resources = 9, Matrix = 9). Analyses showed that abstinent Matrix subjects showed significantly greater engagement in the treatment process compared to nonabstinent Matrix subjects in terms of length of treatment (23 weeks vs. 9 weeks; \( t = 5.40, df = 1, 46, p < .001 \)) and number of treatment activities per week (2.12 activities vs. 1.62 activities; \( t = 2.64, df = 1, 46, p = .01 \)). By contrast, abstinent community resource subjects reported similar attendance rates at 12-step groups and treatment programs to nonabstinent community resource subjects. Although measurement of community resource treatment participation was not comparable to that for Matrix subjects, these results indicated that Matrix subjects who participated in more treatment activities over a longer period of time were significantly more likely to be abstinent at 1-year follow-up.

**Conclusions From the Controlled Trial.** Data from this study supported the value of the model’s utility but fell short of being a definitive empirical confirmation of the model’s efficacy. The tremendous heterogeneity of treatment experiences among community resources subjects made differential treatment group outcomes undetectable. Detecting differential treatment outcomes was also hampered by the lack of a lead-in or screening period in the study design. Early subject attrition substantially reduced the number of subjects in both conditions who received meaningful treatment doses, which made it difficult to find statistically significant treatment differences between groups of subjects. However, there were several indications that subjects in the Matrix condition had superior outcomes related to increased levels of program
participation, which were not present for community resources subjects. The indications for Matrix group subjects replicated the initial suggestions of a dose-response association that emerged from the open trial. Further, that subjects strongly engaged in Matrix treatment displayed better outcomes at 12 months than those less engaged and that community resources subjects showed no associations between engagement and outcome implied that the better Matrix outcomes may have been due to some quality of the treatment rather than subject characteristics (e.g., motivation).

That the Matrix model retained subjects for significant treatment durations supports the model’s clinical utility. The model retained urban crack cocaine smokers for substantial treatment episodes. Two thirds of Matrix subjects completed 6 weeks or more of treatment, and one quarter of Matrix subjects completed 6-month treatment episodes. These retention data compared favorably with other outpatient psychosocial treatments (e.g., Carroll et al., 1991; Kang et al., 1991) used with urban crack smokers. Although design limitations precluded definitive statements concerning Matrix treatment over a community referral condition, the apparent dose-response association for subjects in the Matrix treatment condition and the ability of the model to retain subjects for substantial treatment episodes provided convergent support for the efficacy of the treatment model. An appropriate conclusion from the data from the controlled trial are that the clinical value of the Matrix treatment model was supported, but study design limitations interfered with making a definitive statement on the efficacy of the model.

**SUMMARY**

This anthology of reports is intended to describe (a) the process undertaken to create an outpatient treatment approach for cocaine abuse that was based upon empirically derived principles and (b) the research undertaken to establish an empirical base for the value of this model. The realities of the cocaine epidemic of the 1980s required that the treatment be implemented in the treatment system before data were available to provide the desired empirical foundation. However, as the techniques that made up the Matrix model were implemented over time, an effort was made to systematically collect evidence on the value of the treatment procedures in order to validate and refine these procedures.

This strategy to conduct a series of research projects over time to evaluate the model in different designs, with different populations and with different dependent measures, has been largely although not entirely successful. The research effort has documented that participation in this intensive outpatient model of treatment by cocaine abusers is associated with substantial, statistically significant, and clinically meaningful reduction in cocaine use. All studies have demonstrated this result. Two of the studies have documented a clear, positive dose-response relationship between time in treatment and positive outcome at 1-year postadmission. Psychosocial measures of functioning consistently showed statistically significant improvement across all studies. Due to methodological problems, the controlled trial did not definitively establish the superiority of this model to other community treatment approaches. However, the weight of evidence from the data collected to date clearly support the clinical value of this treatment approach.

The research on this treatment model is continuing at Matrix and other settings. A recent report by the Matrix group has documented the value of the treatment approach in reducing the high-risk sexual behavior of stimulant users at risk for HIV transmission (Shoptaw, Rawson, McCann, & Obert, 1994). Magura et al. (in press) have demonstrated that this treatment model produces a significant reduction of cocaine/crack use by methadone maintained patients who abuse cocaine. This study, conducted with random assignment does give clear support for the value of the Matrix model with this population. Castro, Barrington, Schackleton, and Rawson (1992) have conducted an evaluation of the Matrix model with stimulant addicts in a design that compares the effectiveness of the model to treatment in an in-patient chemical dependency program. The analysis of this project should provide some useful information about the characteristics of stimulant abusers best suited for treatment in the Matrix model.

The authors' future research efforts on this treatment approach will take two forms. The controlled research will focus on well-designed, well-controlled evaluations of specific components of the Matrix model. For example, the relapse prevention component is a central element in the model. Systematic studies to assess the clinical impact of this technique will give an empirical test to the efficacy of this treatment strategy. This strategy of focusing research efforts on a specific well-defined technique is a result of the experience in the controlled trial. Designs that attempt to evaluate complex, multicomponent integrated packages of treatment using random assignment appear likely to encounter the same methodological problems experienced in the previous Matrix controlled trial.

The other type of research that is needed on this model are well-designed outcome studies of the model as it is currently being delivered in the public and private sectors. These outcome studies, conducted without randomly assigned control groups, are necessary to help bring into the existing treatment system an accountability that is being demanded in the healthcare field today. Use of well-designed pre-post evaluations that examine the differential impact of the Matrix treatment procedures on different treatment popula-
tions will help to introduce outcome research methods into the existing treatment system. The outcome studies currently underway at Matrix can provide a model for encouraging the use of outcome data in the future design of the substance abuse treatment delivery system.

REFERENCES


