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The Interaction of Co-Occurring Mental Disorders and Recovery Management Checkups on Substance Abuse Treatment Participation and Recovery

Brian R. Rush,

Center for Addiction and Mental Health, Toronto, Canada

Michael L. Dennis,

Chestnut Health Systems, Bloomington and Chicago, Illinois

Christy K. Scott,

Chestnut Health Systems, Bloomington and Chicago, Illinois

Saulo Castel, and

Whitby Mental Health Center, Whitby, Canada

Rodney R. Funk

Chestnut Health Systems, Bloomington and Chicago, Illinois

Abstract

This article examines the effectiveness of quarterly Recovery Management Checkups (RMCs) for people with substance disorders by level of co-occurring mental disorders (34% none, 27% internalizing disorders, and 39% internalizing and externalizing) across two randomized experiments with 92% to 97% follow-up. The 865 participants are 82% African American, 53% female, and age 37 on average. RMC involves identification of those in need of treatment, motivational interviews, and treatment linkage assistance. It is effective in linking participants in need to treatment, with equal or better outcomes among those with more mental disorders. The data support the utility of monitoring and re-intervention for clients with co-occurring disorders.

Keywords

co-occurring disorders; recovery management; substance abuse treatment outcome

Given that substance use disorders are often chronic conditions that may last decades, it is hardly surprising that it takes an average of three to four admissions to treatment for 9 years to reach a sustained recovery (Anglin, Hser, and Grella 1997; Dennis et al. 2005; Grella and Joshi 1999; Hser et al. 1997; Hser et al. 1998). In recognition of these findings and other

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Please address correspondence to Brian R. Rush, Center for Addiction and Mental Health, Room T304, 33 Russell St., Toronto, Ontario, M5S 2S1 Canada; phone: (416) 535-8501 (ext. 6625); brian_rush@camh.net. Questions about the Recovery Management Checkup intervention can be addressed to Christy K. Scott, Chestnut Health Systems, 221 W. Walton, Chicago, IL 60610; phone: (312) 664-4321; fax: (312) 664-4324; cscott@chestnut.org. Questions about the broader early re-intervention studies can be addressed to Michael L. Dennis, Chestnut Health Systems, 720 West Chestnut, Bloomington, IL 61701; mdennis@chestnut.org.

factors relevant to the role of treatment in the overall life course of substance use disorders (Hser, Longshore, and Anglin 2007[this issue]), there have been increasing calls for shifting treatment from its current focus on acute episodes of care to a chronic care paradigm (Dennis and Scott in press; McLellan et al. 2000; Scott and Dennis under review; Weisner, Matzger, and Kaskutas 2003). This public health approach to longitudinal monitoring and early re-intervention (ERI) provides the foundation for Recovery Management Checkups (RMCs; Scott and Dennis 2003), an evidence-based approach for managing substance users through multiple episodes of treatment. The RMC intervention targets individuals who have previously participated in treatment and are now living in the community using substances. The intervention (described in more detail later) aims to provide immediate linkage back to substance abuse treatment on the basis of need, thus expediting the recovery process. Key components include, for example, assessing eligibility for the intervention and need for treatment, transferring participants in need of treatment from the interviewer to a linkage manager for a brief intervention, linking participants to the intake assessment, and ultimately linking participants to treatment. The intervention does not target or address concurrent disorders specifically. In two closely related experiments (Dennis, Scott, and Funk 2003; Scott and Dennis under review), participants randomly assigned to RMC or a control group were just as likely to be in need of treatment at some time during the 24 months (82%), but those assigned to get quarterly RMC were significantly more likely than those assigned to the control group to return to treatment sooner, return to treatment at all, have more total days of treatment, and have fewer successive quarters of unmet need for treatment and were less likely to be in need of further treatment at the end of the study.

Building on the initial encouraging reports of the RMC intervention, we sought to examine how its effectiveness may vary when working with clients with co-occurring mental and substance use disorders. The research addressed the following two study questions:

1. Is the RMC intervention effective with clients with co-occurring mental and substance use disorders?
2. Does the effectiveness of the intervention vary across client subgroups differing in terms of complexity and severity of these co-occurring disorders?

The Prevalence of Co-Occurring Disorders and Their Interaction With Outcomes

The high rate of co-occurrence of mental and substance use disorders in the community (e.g., Grant et al. 2004; Kessler et al. 1997; Kessler et al. 1996; Kessler et al. 2005; Merikangas et al. 1998; Regier et al. 1990) is now widely recognized, as is the negative impact of this comorbidity on the overall life course of the individual. This negative life course includes, for example, a higher probability of victimization (Gearon and Bellack 1999; Mueser et al. 1998), homelessness (Drake, Osher, and Wallach 1991), and incarceration (Drake and Brunette 1998); seeking help from substance abuse and/or mental health treatment services (Kessler et al. 1996; Regier et al. 1993); and relapse and readmission (Moos, Mertens, and Brennan 1994). Indeed, co-occurring mental disorders are recognized as a particularly prominent characteristic of those who present for publicly

funded substance abuse treatment (Chan, Dennis, and Funk in press; Diamond et al. 2006; Hien et al. 1997; Regier et al. 1990; Ross, Glaser, and Germanson 1988; Tims et al. 2002).

Many studies have shown the negative effect of psychiatric comorbidity on substance abuse treatment outcomes (e.g., Carroll et al. 1993; Kranzler, Del Boca, and Rounsaville 1996; McLellan et al. 1983; Rounsaville et al. 1986; Rounsaville et al. 1982; Project MATCH Research Group 1997; Weisner, Matzger, and Kaskutas 2003), and attenuated treatment engagement and early dropout have been identified as key factors in contributing to these negative outcomes (e.g., Booth, Cook, and Blow 1992; Carroll et al. 1993; Hanson, Kramer, and Gross 1990). It is reasonable to assume that a very complex interaction of client and program environment characteristics underlies poorer program engagement and retention. This includes factors related to symptoms of specific diagnoses (e.g., past trauma histories or social anxieties that make group therapy too challenging, poor anger management or impulsiveness contributing to early termination, depressed mood resulting in missed appointments) as well as factors associated with the life problems and reduced social capital that seem to coincide with psychiatric impairment and substance use disorders (e.g., poor or no housing, legal difficulties, poor social network, financial problems; Alterman, McLellan, and Shifman 1993; Stoffelmayr et al. 1989). Many of these challenges have been addressed in the ideal treatment components and principles recommended for specialized, integrated concurrent disorder programs (e.g., Drake et al. 2004; Mueser et al. 2003). Many of the recommended principles and practices are also appropriate for more generic substance abuse treatment services (see, e.g., Center for Substance Abuse Treatment 2005; Moggiet al. 1999), and several elements of the RMC treatment model are highly consistent with these recommendations. Such features include supportive/motivational rather than confrontational approaches; dealing with practical issues and life problems, such as legal and financial barriers; and a major emphasis on relapse prevention. Participation in extended treatment, aftercare, or continuing care management has been shown to improve outcomes (Godley et al. in press; McKay 2001; Moos and Moos 2006) and is also a recommended element of evidence-based treatment for clients with co-occurring disorders. Ongoing monitoring and feedback are fundamental underpinnings of the RMC model.

RMC and the Life Course Model of Addiction

Viewing the RMC intervention from a life course perspective (Hser et al. 2007[this issue]), there are also several features of the intervention that suggest it may be particularly effective with people with co-occurring disorders and, furthermore, that the impact of the intervention may increase in concert with the severity of the client's mental health and substance use profile. Three key concepts embedded in the life course perspective are social capital, turning points, and recovery capital. The RMC linkage management function is a critical component aimed at managing the significant loss of social capital (e.g., poor housing, marginalization, financial problems, stigma, poor health status resulting from the experience of living with these co-occurring conditions; Alterman, McLellan, and Shifman 1993; Center for Substance Abuse Treatment 2005; Substance Abuse and Mental Health Services Administration 2002; Stoffelmayr et al. 1989). During their brief intervention, linkage managers rely heavily on motivational interviewing (MI) techniques (Lamb, Greenlick, and McCarty 1998; Miller and Rollnick 2002; National Institute on Drug Abuse [NIDA] 1999).

A unique aspect of the RMC intervention, however, is the idea that people require ongoing monitoring and multiple exposures over time (up to seven in this experiment), that they also have real personal and organizational barriers to reentry that may need to be addressed, and that it is important to make sure that they actually engage and stay in treatment (not just start it). The linkage managers use MI techniques to help participants resolve their ambivalence about their substance use and to move toward a commitment to change by accessing additional care, addressing existing barriers to treatment, reviewing the client's perceptions of social support, scheduling a treatment assessment and facilitating treatment reentry (reminder calls and transportation), and completing a recovery management follow-up plan. Although this clearly targets issues related to lost social capital, it does so by focusing very specifically on return to substance abuse treatment as the key to recovering lost capital, rather than direct provision of wraparound services or ongoing case management.

Furthermore, the linkage manager may function as a preemptive turning point, capitalizing on the individual's initial contact with the treatment program and then actively supporting program entry and continuation. To the extent that the treatment experience is the turning point, the linkage manager is the catalyst, and this catalyst may be increasingly important as severity increases and more life stresses, such as poor housing, job instability, and financial or legal problems, impinge on active treatment participation. In addition, the RMC intervention's ongoing in-treatment reinforcement that post-treatment support will be available may add to the individual's recovery capital, as will the multiple posttreatment checkups themselves. Observational studies (Dennis, Scott, and Funk 2003) suggest that the extent to which RMC increases the likelihood and duration of abstinence, the greater the likelihood of increased recovery capital in terms of clean and sober friends, social and spiritual support, vocational engagement, and income. The more severe the comorbidity profile, the higher the risk of early dropout (Cacciola et al. 2001; Carroll et al. 1993) and the more important this accumulated recovery capital may become in returning clients to treatment and retaining them for sufficient duration to yield a positive outcome.

Measuring Co-Occurring Disorders

Best practice guidelines for treatment of co-occurring disorders advocate a diagnostic-based approach so as to incorporate disorder-specific guidelines for treatment of, for example, depression, posttraumatic stress disorder, bipolar illness, schizophrenia, and borderline personality disorders (BPDs), as well as for the many subcategories of alcohol and drug use disorders themselves (Center for Substance Abuse Treatment 1994, 2005; Health Canada 2001; Substance Abuse and Mental Health Services Administration 2002; White, Boyle, and Loveland 2002). Unfortunately, the multimorbidity across diagnostic categories (excluding substance use disorders; Kessler et al. 2005; McDermott, Mattia, and Zimmerman 2000), and the complexity of studying all possible combinations of diagnoses, has made applications of these guidelines difficult at times. Thus, there is also an interest in identifying treatment approaches that have been shown to be effective across many common mental disorders. Examples include cognitive behavioral therapy and the new generation of medications, such as selective serotonin reuptake inhibitors, which are useful for depression and almost all anxiety disorders (Work Group on Major Depressive Disorder 2000). It is also

possible that broader diagnostic groupings may be helpful for framing and addressing new research questions that may guide more targeted program development and delivery.

Much of the early literature on co-occurring disorders arose from the mental health field and focused on the broad class of disorders falling under the rubric of severe and persistent mental illness (e.g., schizophrenia spectrum disorders; Drake et al. 1996). However, people with psychotic and other disorders falling under the general rubric of severe and persistent mental illness are much less frequently seen in substance abuse treatment settings than in the mental health sector (Ross, Glaser, and Germanson 1988; Virgo et al. 2001). Other studies of the prevalence and impact of co-occurring mental disorders in the substance abuse treatment population have distinguished between Axis I and Axis II disorders (the latter focused on personality disorders) and have identified differential baseline characteristics and treatment outcomes (e.g., Cacciola et al. 2001; Kranzler, Del Boca, and Rounsaville 1996; Lewis et al. 1995, Schaar and Ojehagen 2001). To summarize briefly, these studies generally show higher rates of polysubstance use and related problems, more criminal justice involvement, higher attrition rates from treatment, and poorer outcomes for those with Axis II disorders. Other recent research, however, suggests that the Axis I to Axis II distinction is not necessarily the most useful breakdown for subclassifying the substance abuse treatment population, as many symptoms present in both conditions (e.g., mood fluctuations and impulsivity in bipolar affective disorder and BPD, difficulty managing anger and aggressive impulses in BPD and the Axis I intermittent explosive disorder; American Psychiatric Association 2000), and there is the lack of behavioral restraint characteristic of some forms of attention deficit hyperactivity disorder (ADHD) and some personality disorders (Carlton and Manowitz 1992). In addition, an Axis II disorder present in adulthood (e.g., avoidant personality disorder) may reflect an untreated Axis I disorder from an earlier stage in life (social anxiety disorder).

Studies in samples drawn from both the general population (Achenbach and Edelbrock 1978; Krueger 1999; Krueger et al. 2003; Vollebergh, Dennis, and Funk 2001) and, more recently, in substance abuse treatment settings (Chan, Dennis, and Funk in press; Dennis et al. 2003, Dennis and Scott in press) suggest that the most common co-occurring mental disorders found among people with substance use disorders can be classified into two broad groups: (a) internalizing disorders (anxiety and mood disorders) and (b) externalizing disorders (ADHD, antisocial personality disorder, conduct disorder [CD], and oppositional defiant disorder). Although externalizing disorders have traditionally been thought of in terms of adolescents, recent research suggests that symptoms of ADHD and CD may persist into adulthood and can affect psychosocial functioning (Kessler et al. 2006; Levin, Evans, and Kleber 1998; Wender, Wolf, and Wasserstein 2001; Wilson and Levin 2001). Chan et al. (in press) have recently established that although these externalizing disorders are indeed more common among adolescents than adults, they do present in a significant proportion of adult treatment participants and are strongly associated with the risk of substance dependence.

Severity of substance abuse and mental health comorbidity can be assessed in different ways (e.g., symptom expression and level of impairment on daily functioning). In the present study, we use the count of disorders across the broad internalizing and externalizing

categories as a proxy for case severity. The comorbidity literature suggests that having diagnoses in more classes (and implicitly more diagnoses) is associated with greater functional impairment in general (Angst, Sellaro, and Ries 2002; Batstra, Bos, and Neeleman 2002; McDermott, Mattia, and Zimmerman. 2001). In the general population, multiple substance use and mental disorders have been shown to be associated with a higher probability of accessing mental health and other services (Helzer and Pryzbeck 1988) as well as higher psychiatric severity (Kessler et al. 2005). These findings could be due to both the failure to obtain effective treatment and more severe symptom expression. In a substance abuse treatment population, Kranzler et al. (1996) reported that the (lifetime) number of disorders experienced by clients was associated with a global measure of psychopathology. Alterman, McLellan, and Shifman (1993) also reported that the number of mental disorders predicted the range and severity of problems in life areas other than substance abuse specifically. More recently, Castel et al. (2006) found that treated clients with more mental disorders were more marginalized in terms of unemployment and low social support, as well as presenting with multiple problem substances. Thus, we would anticipate that those with mixed comorbidity, namely, both internalizing and externalizing disorders, will present with more severe problems and be more likely to relapse. This hypothesis was confirmed by Shane, Jasiukaitis, and Green (2003) for adolescents in substance abuse treatment.

Research Hypotheses

Building on the initial encouraging reports of the RMC intervention, the importance of finding interventions that will retain clients with co-occurring disorders in treatment and improve their outcomes, and the potentially effective design features inherent in the RMC model for this subpopulation, we examine here whether quarterly RMCs for 2 years are effective within subgroups self-reporting different patterns of co-occurring mental disorders (substance use disorder only, substance plus internalizing disorders, and substance plus internalizing plus externalizing disorders). We hypothesize that (a) within each subgroup, RMCs will do significantly better than the control group in terms of the days to readmission, percentage reentering treatment, total days of treatment, total days of abstinence, number of successive quarters of unmet need, and at the last interview, days of abstinence, number of past month symptoms of abuse/dependence, and percentage in need of treatment and (b) that as the severity of co-occurring mental disorders increases, so will the effectiveness of RMC.

Method

Design Overview

To ensure adequate sample size and power for the proposed analyses, we combined data from the ERI Experiment 1, conducted with 448 people recruited in 2000 (Dennis et al. 2003; Scott, Dennis, and Foss 2005), and Experiment 2, conducted with 446 people recruited in 2004 (Dennis and Scott in press; Scott and Dennis under review). The target population for both experiments was people presenting to publicly funded substance abuse treatment. Participants were recruited from sequential intakes at the same substance abuse treatment organization in Illinois, and the same inclusion/exclusion criteria were used. In both studies, participants were randomly assigned to quarterly RMCs (Scott and Dennis

2003) or a control group and assessed quarterly for 2 years with the Global Appraisal of Individual Needs (GAIN; Dennis et al. 2003). The 891 participants (across experiments) were initially classified into one of four mutually exclusive patterns of co-occurring disorders: 295 (33%) substance use disorder only, 230 (26%) substance plus internalizing disorders, 26 (3%) substance plus externalizing disorder, and 340 (38%) substance plus internalizing plus externalizing disorders. The substance plus externalizing disorder was too small to support subgroup analysis and was dropped, leaving a combined sample size of 865 for the analysis presented here. The main analyses from the original experiment were then replicated within each of the three remaining subgroups. Below are further details.

Participants

To be included in each experiment, individuals needed to (a) meet lifetime criteria for substance abuse or dependence, (b) have used alcohol or other drugs during the 90 days prior to intake, (c) complete an intake assessment and receive a referral to substance abuse treatment at the collaborating treatment agency, and (d) be 18 years of age or older. Logistical constraints in providing the RMC intervention required that individuals be excluded if they (a) did not reside in the city of Chicago or (b) did not plan to reside in the city during the ensuing 12 months or (c) had been sentenced to jail or prison or a DUI program for most of the upcoming 12 months or (d) were unable to speak and understand English or Spanish or (e) were too cognitively impaired to provide an informed consent. Participation was voluntary after an informed consent process under the supervision of Chestnut's Institutional Review Board on Human Subjects was completed, and the study was conducted under the protection of a Federal Certificate of Confidentiality issued by the NIDA. In the first experiment, 84% (448/533) of the eligible people agreed to participate, and 93% (446/480) agreed in the second experiment. As noted earlier, we dropped 26 (3%) participants who met criteria for substance plus externalizing disorders. Of the remaining 865 participants considered here, most were female (53%) and African American (82%, 8% Caucasian, 4% Hispanic, and 6% Other), and the mean age was 37.3. At the time of intake, 16% were married, 31% were employed, and 30% were homeless. More detailed sample characteristics are described in the first part of the results section.

Setting and Prerandomization Index Episode of Care

Prior to randomization, participants were initially referred to outpatient (8%), intensive outpatient (19%), short-term residential (25%), long-term residential (47%), or detoxification/other (1%) treatment. The index episode of treatment lasted an average of 44.4 days, with 14% still in treatment at 90 days (the point of randomization). The intake unit, index episode, and most of the subsequent treatment were managed by a single treatment agency accredited by Medicaid, the State of Illinois, and the Committee on the Accreditation of Rehabilitation Facilities. This agency used *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text revision; *DSM-IV-TR*; American Psychiatric Association 2000) criteria for diagnosis and American Society of Addiction Medicine (2001) criteria for placement. There were no significant differences in level of care, length of stay, or being in the index treatment 90 or more days by co-occurring disorder condition.

Randomization

After all participants agreed to participate, an Excel file was used to sort them by interview date and research ID and then to randomly assign them to the control or RMC conditions for the duration of the study. Assignments were blocked into groups of six to prevent runs to one condition. The field coordinator was notified of all assignments, and research assistants communicated individual assignments to participants during the first quarterly follow-up interview. The study was not blind because staff needed to transfer participants to the linkage managers to conduct the RMC intervention following the interview and to schedule RMC participants for longer periods of time to accommodate the linkage meeting. To control for contamination, randomization was done externally, all interviews and linkage meetings were audiotaped (and a random sample reviewed), and different staff conducted interviews and the intervention with RMC participants.

Conditions

Control condition—In both experiments, half of the participants randomly assigned to the control group were interviewed with the GAIN at baseline and quarterly for 2 years. There was no explicit attempt, however, to assess the need for treatment reentry or to make referrals for further care. Once the assessment was completed, a research assistant updated the locator information and scheduled the next quarterly follow-up appointment.

RMC experimental condition—As with the control group, research staff conducted baseline and quarterly interviews with participants assigned to the experimental RMC condition. The RMC protocol is manual guided (Scott and Dennis 2003) and sets out procedures to identify participants living in the community, using substances, and not currently in treatment or incarcerated and to provide immediate linkage to treatment. RMCs were conducted regardless of prior length of stay, discharge status, or participation in RMC in prior waves. In both experiments, RMC involved the following key steps: (a) locating the person for a follow-up interview, (b) determining the eligibility for the intervention (i.e., verifying that the person was not already in treatment or jail and was living in the community) and need for treatment, (c) transferring participants in need of treatment from the interviewer to the linkage manager for a brief intervention, (d) obtaining participant agreement for an intake assessment for treatment, (e) linking participants to the intake assessment, and (f) linking participants to treatment. In the second experiment, there was greater emphasis on transportation to the initial appointment and regular contact during the first 14 days after admission to make sure that the person engaged in treatment (Dennis and Scott in press; Scott and Dennis under review).

Data Sources and Measures—Diagnostic criteria, functioning, service use, and outcomes were based on self-report from the GAIN (Dennis et al. 2003). The GAIN is a comprehensive, structured interview with eight main sections (background, substance use, physical health, risk behaviors, mental health, environment, legal, and vocational). As part of ERI and other studies, the GAIN's main scales demonstrated good internal consistency (an alpha of more than .90 on main scales and .70 on subscales) and test-retest reliability (rho more than .70 on days/problem counts and kappa [κ] more than .60 on categorical measures) and were highly correlated with measures of use from timeline follow-back, urine tests,

collateral reports, and treatment records (ρ of .70 or more and κ of .60 or more) (Buchan et al. 2002; Dennis et al. 2002; Dennis, Chan, and Funk 2006; Dennis et al. 2004; Dennis et al. 2003; Scott and Dennis under review). In a discriminant analysis using the GAIN to predict independent and blind staff psychiatric diagnoses, the κ s were 1.00 for ADHD, 0.85 for mood disorders, 0.82 for CD/oppositional defiant disorder, 0.69 for adjustment disorder, 0.91 for absence of a non-substance-use diagnosis, and 0.65 for other primary disorders across these conditions (Shane, Jasiukaitis, and Green). These strong validation data notwithstanding, the GAIN data on mental disorders are based on self-report and thus cannot be reported as confirmed clinical diagnoses. Rather, we report the extent to which diagnostic criteria for a particular disorder or grouping of disorders have been met, or not met, by these self-report measures.

For study purposes, the past year major *DSM-IV-TR* (American Psychiatric Association 2000) diagnoses included self-reporting criteria for (a) substance use disorder: dependence and abuse; (b) internalizing disorders: major depressive disorder, generalized anxiety disorders, and traumatic distress disorders (e.g., posttraumatic stress disorder, acute stress disorder, and disorders of extreme stress not otherwise specified, such as those resulting from child maltreatment); and (c) externalizing disorders: ADHD and CD. Chan et al. (in press) provide an empirical demonstration that although the prevalence of externalizing disorders decreases with age, they are still relatively common among adults presenting to treatment (ranging from 48% among participants ages 18 to 25 to 36% among participants ages 40 and older) and particularly more likely among those with past-year dependence relative to abuse/other (odds ratio = 8.4 for ages 18 to 25 to 7.1 for ages 40 and older).

Table 1 lists the definitions of the participant outcome measures reported in this article. For the outcome measures, the table reports reliability in terms of the Cronbach's alpha for a scale, Spearman's rank order correlation (ρ) for test-retest of continuous variables, and κ for test-retest of dichotomous measures. The latter two are from a test-retest study done as part of the final (24-month) wave of ERI-1 data collection as reported in Dennis et al. (2003). Copies of the full GAIN, its completion times, and more detailed information on the GAIN scales, mental health measures, and other created variables are publicly available at www.chestnut.org/li/gain.

Analytic Procedures

All analyses were done with the overall sample and within each comorbidity subgroup using Statistical Package for the Social Sciences (2005) and an "intent to treat" model (Dennis et al. 2000). This means that (a) people were analyzed as randomly assigned, regardless of whether they needed or received RMC services, and (b) for the small amount of missing data by wave, we imputed the answers as noted in Table 1. Data were used from all available interviews (99% completed one or more interviews and 85% completed all eight quarterly interviews).

Cox Proportional Hazard survival analysis was conducted on the time from the 3-month interview (point of randomization) to the first subsequent readmission, treating people who had not returned to treatment by their last interview as right censored (i.e., they had not reentered treatment; with 48% of the observations being right censored). For dichotomous

outcome measures (e.g., percentage reentered treatment, percentage needing treatment at the last quarterly observation), the differences between conditions were tested using an exact chi-square. For most of the continuous participant outcome measures (e.g., total days of treatment, total days of abstinence, the number of successive quarters of unmet need for treatment), reliable differences were tested with analysis of covariance and reported in terms of an *F* statistic for the condition (experimental vs. control), with the baseline and 3-month values of the respective dependent variables as covariates. These multivariate models were run with and without controlling for the number of substance use disorders as well as each type of dependence disorder as covariates (e.g., alcohol, cannabis, cocaine). These potential covariates did not affect the results, and only the findings from the unadjusted analytic models are reported here.

Because the three comorbidity groups have multiple clinical differences (see results), the RMC versus control differences between groups were compared conservatively in terms of their within-study effect sizes in the same way that this issue is handled in a meta-analysis. The process and outcome figures and tables include Cohen's effect size *d*, where $d = \pm 0.2$ is considered small, $d = \pm 0.4$ is medium size, and $d = \pm 0.8$ or more is large. If the *d* was 0.2 or greater but the alpha was greater than .05, we referred to this as a "trend." The effect sizes reported here are based on Formula 1 for dichotomous measures, Formula 2 for continuous measures, and Formula 3 for chi-square conversion of survival analyses.

$$d = 2 * \arcsin(\% \text{ from ERI-2}) - 2 * \arcsin(\% \text{ from ERI-1}) \quad (1)$$

$$d = (\text{ERI-2 mean} - \text{ERI-1 mean}) / \text{pooled standard deviation} \quad (2)$$

$$d = \text{square root}((4 * (\chi^2)) / (n - (\chi^2))) \quad (3)$$

Results

Pattern of Co-Occurring Mental Health Conditions

Of the 865 participants in the combined sample considered here, 34% met criteria for substance use disorders only, 27% for substance plus internalizing disorders, and 39% for substance plus internalizing plus externalizing disorders. Table 2 gives the proportion of the overall study sample meeting criteria for various mental disorders and shows how these proportions vary by the three derived co-occurring disorder subgroups. Although 66% met criteria for any internalizing disorder, by definition, these were all in the second or third group. Relative to the second group (substance plus internalizing), the members of the third group (substance plus internalizing plus externalizing) were significantly more likely to meet criteria for depressive disorders (77% vs. 93%), anxiety disorders (56% vs. 75%), and trauma-related disorders (35% vs. 75%). Although 39% met criteria for an externalizing disorder, by definition, all were in the third group. This includes 30% (76% of subset)

meeting criteria for ADHD, 30% (76% of subset) for CD, and 5% (13% of subset) for pathological gambling. The two groups with mental disorders (substance plus internalizing compared to substance plus internalizing plus externalizing) differed with respect to the mean number of mental disorders (1.73 vs. 4.05) as well as the percentage meeting criteria for three or more mental diagnoses (19% vs. 91%).

Correlates and Prognostic Significance of Co-Occurring Mental Health Conditions

Table 3 compares the demographic and clinical characteristics of the three subgroups. As the complexity of co-occurring disorders increased, participants were significantly more likely to be female and to have been homeless but less likely to be African American. As complexity increased, participants were also more likely to be involved in crime, to be victimized, to have health problems, to engage in high-risk sexual behaviors, and to use more services. In terms of substance use, as complexity increased, participants were significantly more likely to use alcohol or other drugs at least weekly, to have started using at age 15 or younger, to have multiple dependence diagnoses, and to have more prior experiences in substance abuse treatment. All participants met criteria for substance use disorders (92% dependence), with the most common being cocaine dependence (66%), alcohol dependence (32%), opioid dependence (28%), and cannabis dependence (7%). In each case, the rates increased significantly with the complexity of co-occurring disorders (e.g., from 20% to 29% to 44% for alcohol dependence and 49% to 72% to 77% for cocaine dependence). As complexity of co-occurring disorders increased, participants were more likely to meet criteria for a lifetime dependence diagnosis, each of the individual alcohol/drug dependence diagnoses, and multiple dependence diagnoses. They were also increasingly likely to recognize their substance use as problematic, to desire help, and to be internally motivated to change and less likely to feel that they had the self-efficacy to resist relapse. As one would expect, the rates of mental health impairment and treatment increased with co-occurring complexity. However, even among those not meeting criteria for any mental disorder, there were often some mental health/emotional problems or a history of mental health treatment.

Effectiveness of RMCs by Complexity of Mental Health Conditions

All three groups had high rates of needing to return to treatment in one or more quarters during the 2-year study (88% vs. 84% vs. 84%, *ns*). Figure 1 shows the time from the point of randomization at the 3-month interview to the first substance abuse treatment readmission (plotted as a regression line to smooth it out) by the three subgroups based on complexity of co-occurring disorders. It illustrates how the time to readmission was significantly shorter for people meeting criteria for any co-occurring mental disorder (internalizing or internalizing plus externalizing) than those meeting criteria only for substance use disorders (-311 days, $X^2_{(1)} = 15.37$, $p < .05$). Figure 2 provides another view of the time to readmission data and shows the comparison of RMC versus control within each of the three subgroups. Although the RMC significantly reduced the time to readmission, there was not a major difference in the net gain across the three subgroups in this outcome variable.

Table 4 provides more detailed summary statistics for these figures and presents the results on the remaining outcomes. As suggested in Figures 1 and 2, participants assigned to RMC

were more likely than those assigned to the control group to have fewer days to readmission (-294 days, $d = 0.31$, $X^2_{(1)} = 20.41$, $p < .05$). They were also more likely to be readmitted to treatment at least once (59% vs. 45%, $d = 0.33$, $X^2_{(1)} = 17.52$, $p < .05$), have more days in treatment (59 vs. 39 days, $d = 0.24$, $F_{(1,818)} = 13.15$, $p < .05$), receive 90 or more days of treatment across episodes (26% vs. 18%, $d = 0.18$, $X^2_{(1)} = 9.47$, $p < .05$), have more days of abstinence (489 vs. 462 days, $d = 0.16$, $F_{(1,816)} = 7.23$, $p < .05$), have fewer successive quarters of unmet need for treatment (2.2 vs. 2.9 quarters, $d = -0.21$, $F_{(1,863)} = 13.49$, $p < .05$), and were less likely to still be in need of treatment at the end of 24 months (40% vs. 51%, $d = -0.23$, $X^2_{(1)} = 8.68$, $p < .05$). Thus, the intervention was highly successful for the overall study population.

Comparing across subgroups, we observe that the RMC was associated with significant improvements in two outcomes—readmission and reductions in time to readmission—irrespective of the complexity of co-occurring disorders. These were the only two outcomes significantly improved for the substance-only subgroup. For the substance plus internalizing group, RMC was significantly associated with other outcomes related to program retention: namely, higher mean days in treatment (although this is not necessarily consecutive days of treatment) and percentages with 90 or more days of treatment (again not necessarily consecutive). For the substance use plus internalizing plus externalizing disorders group, RMC was not significantly associated with either of the two measures of treatment exposure. However, close inspection of Table 4 shows that the lack of statistical significance on the two measures of treatment exposure for this subgroup was due to the improved performance of the control condition rather than a decline in performance for the RMC condition itself. Furthermore, the substance use plus internalizing plus externalizing disorders group was the only subgroup with significant improvements in the more distal substance use outcome measures: namely, abstinence, successive quarters of unmet need, and the percentage in need of treatment at the end of the study.

Discussion

There is ample evidence accumulating that individuals with severe substance dependence cycle through multiple treatment admissions during the life course (Anglin, Hser, and Grella 1997; Dennis et al. 2005; Grella and Joshi 1999; Hser et al. 1997; Hser et al. 1998), such that any cross-sectional snapshot of the treatment population will generally reveal that more than half of the people admitted having had prior treatment experiences (Office of Applied Studies 2005). Dropout and recidivism are particularly evident among those with co-occurring mental disorders (Carroll et al. 1993; Center for Substance Abuse Treatment 2005), making our test here of the effectiveness of an ongoing model of monitoring and ERI (RMC) for this subgroup in the treatment system highly relevant.

The results presented here are consistent with previous research showing a very high rate of overlap between substance use and mental health conditions in participants presenting for substance abuse treatment (e.g., Chan et al. in press; Krausz et al. 1998; Ross, Glaser, and Germanson 1988). In fact, comorbidity was the norm, with 66% meeting criteria for at least

one mental disorder and 58% for three or more substance use or mental disorders. Also consistent with other studies (Cacciola et al. 2001; Castel et al. 2006; Chan et al. in press; Penick et al. 1994; Rounsaville et al. 1986; Shane, Jasiukaitis, and Green 2003), we found that the clinical presentation of both co-occurring internalizing and externalizing disorders was common (39%)—indeed, more common than internalizing disorders alone (27%). These results also demonstrated that the complexity of co-occurring mental health problems (substance only to substance plus internalizing to substance plus internalizing plus externalizing) is directly associated with multiple treatment episodes and a more severe clinical profile in terms of the severity of substance use disorders and problems reported in other life domains, such as homelessness, crime and violence, and physical health. Interpreted from a life course perspective on treatment, the more complex the comorbidity, the less social capital being brought to the treatment episode.

The more severe clinical profile among those with the more complex mental health comorbidity is also consistent with the evidence from samples drawn from mental health services (McDermott, Mattia, and Zimmerman 2001) as well as general population surveys (Andrews, Henderson, and Hall 2001; Gamma and Angst 2001; Merikangas et al. 1998), showing that individuals with multiple mental disorders have more serious problems in several life areas. This same pattern is found in comorbidity studies in the physical health domain (e.g., Angst, Sellaro, and Ries 2002) and reinforces the notion that “multimorbidity,” expressed as a count of specific conditions or broad subtypes of conditions, can represent the cumulative lifetime consequences of illness experiences (e.g., loss of resources, physical and social disability, quality of life, risk of additional disorders, family burden, help seeking, use of health services; van den Akker, Buntinx, and Knottnerus 1996). In short, our relatively simple measure of mixed internalizing and externalizing mental health comorbidity may serve as a useful proxy measure for participants’ overall biopsychosocial burden. In substance abuse treatment samples, this may also signal a strong likelihood of failed treatment experiences as evidenced by multiple treatment admissions over time. The high overlap in disorders and the corresponding burden of illness also call for a multidimensional but individualized approach to treatment and provision of psychosocial supports for this population.

Sample size limitations obviated the creation of another co-occurring subgroup that met criteria only for externalized disorders. Consequently, we are also faced with a competing hypothesis that the more severe clinical profile in the substance use plus internalizing plus externalizing subgroup is due largely to the symptoms and consequences of the externalizing disorders rather than the number of disorders per se. Some support for this explanation would come from the well-established relationship between externalizing disorders, such as CD, oppositional defiant disorders, and antisocial personality disorders, and factors such as aggressive behavior (Schaeffer et al. 2003), risk of victimization (Burke, Loeber, and Birmaher 2002), marginalization (Miller-Johnson et al. 2002), substance abuse severity (Chan et al. in press; Kranzler, Del Boca, and Rounsaville 1996), and poor treatment engagement (Shane, Jasiukaitis, and Green 2003). Thus, we cannot confidently state the specific role of the externalizing disorders in the poor clinical profile observed in our more complex co-occurring group. It may be the number of disorders (as a proxy for cumulative burden), or it may be the externalizing disorders themselves, or a combination of both

factors. In our baseline data, we also found a relationship between the complexity of co-occurring mental disorders and three separate indices measuring problem recognition, desire for help, and external pressure. We conclude from these findings, and previous research showing that substance abusers with multiple co-occurring mental health disorders are overrepresented among those seeking help (Helzer and Pryzbeck 1988; Penick et al. 1994), that the complexity of psychiatric problems and the associated biopsychosocial burden are primarily predisposing rather than inhibitory factors in bringing individuals into contact with the specialized substance abuse treatment sector. The finding of increased motivation for help among those with more complex psychiatric profiles has also been reported recently in another clinical sample (Castel et al. 2006). Our finding that this same subgroup is more likely to cycle in and out of treatment through multiple episodes points clearly to the need for the kind of ongoing monitoring, ERI, treatment engagement, and retention strategies embedded in the RMC model evaluated here.

From a life course perspective on substance abuse treatment, the overall demographic and clinical profile of those with increasingly complex psychiatric comorbidity highlights the diminished social capital being brought to bear on the index treatment episode (e.g., poor health, homelessness, employment challenges, victimization). However, this diminished social capital is juxtaposed against the accumulated recovery capital of previous treatment experiences as well as internalized recovery capital evidenced by problem recognition, desire for help, and motivation to deal with their substance abuse problems. Importantly, those with more complex comorbidity were actually lower in self-efficacy (confidence that they could succeed in the index treatment) despite these strengths in recovery capital. The linkage management function at the core of the RMC intervention is intended to address the loss of social capital by not only motivating the client to deal with the ambivalence of seeking treatment but also dealing in very practical terms with barriers to accessing service. The primary goal is a return to treatment as the critical step in recovering lost capital, such as key relationships, employment, and housing.

Based on well-established challenges among those with co-occurring disorders in the areas of treatment retention and outcome, we aimed to assess whether the RMC intervention was effective with clients with co-occurring mental and substance use disorders. We conclude with considerable confidence that this proactive, quarterly checkup was successful in returning people to treatment (e.g., reduced days to readmission) if they had co-occurring disorders compared to not having co-occurring disorders and, for this particular outcome, independent of the complexity of this comorbidity as measured here. This is an important finding given the higher likelihood of treatment dropout reported in the literature (Center for Substance Abuse Treatment 2005), and it demonstrates the generalizability of the RMC model with clients with co-occurring disorders. In terms of our second objective, to assess differential effectiveness of the intervention across client subgroups differing in terms of complexity and severity of these co-occurring disorders, our findings are in the expected direction but not strongly so. There was evidence that the RMC intervention was somewhat more effective with respect to key indicators of treatment engagement and outcomes among those participants presenting with the more complex comorbidity profile. That said, we acknowledge that the differences between the two comorbidity groups (substance plus internalizing vs. substance plus internalizing plus externalizing) were not unidirectional.

Thus, it is not clear yet what the nature of the difference is (e.g., pattern of co-occurring disorders, number of diagnoses or diagnostic classes). The inconsistencies may have been different if we could have obtained a formal clinical diagnosis, a larger sample size, or longer follow-up period. In addition, our data do not point to the critical ingredients of the RMC intervention in achieving the outcomes identified here. Based on the diminished social capital evident in the client profile in the more complex co-occurring group, coupled with their higher motivation for help, we suspect the linkage functions (e.g., reminder calls, linking with appointments, transportation and other help dealing with barriers to accessing treatment) served as a catalyst to treatment engagement and the better outcomes.

One limitation of the study was the exclusion of psychotic disorders. Although approximately 10% of the study sample self-reported a lifetime diagnosis of schizophrenia or another psychotic disorder, such self-reports are limited to those who had been treated and who remembered their diagnosis. Because more people experiencing combined psychotic and substance use disorders access mental health compared to substance abuse services (Virgo et al. 2001), the proportion of cases in substance abuse treatment with psychotic disorders is low and perhaps closer to 4% to 5% based on current diagnosis (e.g., Ross, Glaser, and Germanson 1988). Without a standardized measure of psychotic disorders in our study, it was decided to omit this from the analysis and acknowledge this limitation.

Sample size concerns prevented a gender-based analysis, and we acknowledge this as another important limitation. Others have reported differential treatment outcomes for men versus women with specific mental disorders (e.g., Compton et al. 2003; Grella et al. 2007). How potential gender differences would play out based on a broader categorization of internalizing and externalizing disorders and measures of multimorbidity is a topic for future research.

In conclusion, our data would support a staged approach to screening and subsequent assessment and treatment of psychiatric disorders in substance abuse treatment settings. An initial broad-based screen for internalizing and externalizing disorders, now available with a tool such as the GAIN–Short Screener (Dennis, Chan, and Funk 2006), would return valuable information in support of treatment engagement and initial care planning. This should then increase the efficiency of a subsequent diagnostic-based assessment that is required for successful treatment of mental disorders co-occurring with substance use disorders. The data also support the use of the RMC intervention for clients with co-occurring disorders. This staged approach to screening and assessment, coupled with the RMC intervention, may go some measure in reducing the high rates of treatment readmissions over the long-term course of an individual's substance abuse and treatment experiences.

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Biographies

Brian R. Rush is a senior scientist and associate director of the Health Systems Research and Consulting Unit at the Center for Addiction and Mental Health in Toronto, Canada.

Michael L. Dennis, PhD, is the Global Appraisal of Individual Needs coordinating center director and a senior research psychologist at Chestnut Health Systems in Bloomington, Illinois, and a principal investigator of the Early Re-Intervention experiment.

Christy K. Scott, PhD, is the regional director of Chestnut Health Systems' Chicago Office and the coprincipal investigator of the Early Re-Intervention experiment.

Saulo Castel is the director of medical education and research of the Whitby Mental Health Center and assistant professor in the Department of Psychiatry of the University of Toronto, Canada.

Rodney R. Funk is a research analyst in Chestnut Health Systems' Bloomington Office and works on the Early Re-Intervention study.

Figure 1.
Time to Readmission by Complexity of Co-Occurring Mental Disorders

Figure 2.
 Time to Readmission by Random Assignment Within Co-Occurring Disorder Group

Table 1**Summary of Key Measures From GAIN**

1	<i>Reentered Treatment</i> (%; test-retest $\kappa = .81$). Whether the person reentered treatment after the point of randomization (at 3 months) and the final interview (at 24 months or last interview).
2	<i>Total Days Received Treatment</i> ($M = 48$, $SD = 80.38$; test-retest $\rho = .93$). Based on the sum of days an individual received outpatient, intensive outpatient, residential, or inpatient treatment reported at each interview for a given period.
3	<i>Total Days of Abstinence</i> ($M = 475$, $SD = 170.39$; test-retest $\rho = .99$). Sum of days abstinent from months 4 to 24 (max. = 630 days) using the mean days per quarter for any missing observations.
4	<i>Successive Quarters of Unmet Need for Treatment</i> ($M = 2.20$, $SD = 2.32$; test-retest $\rho = .92$). The number of quarters in which the individual started and ended the period “in need of treatment” (see definition below), where missing data were replaced with status at prior wave. Note that this is the primary measure of “clinically significant change.”
5	<i>Days of Abstinence in the Last Quarter</i> ($M = 68$, $SD = 31.11$; test-retest $\rho = .94$). Days abstinent (of 90) reported at the 24-month interview, using the last interview for any missing observation.
6	<i>Past Month Substance Problem Scale</i> ($M = 2.5$, $SD = 4.16$; $\alpha = .93$; test-retest $\rho = .81$). Count of 16 past month items related to weekly use, hiding, using, complaints about use, 4 symptoms of abuse, 7 symptoms of dependence, and substance-induced health or mental health problems.
7	<i>In Need of Treatment</i> (%; test-retest $\kappa = .78$). Defined as a participant living in the community (vs. in incarcerated or in treatment) who was not already in treatment and answered yes to any of the following questions: (a) During the past 90 days, have you used alcohol, marijuana, cocaine, or other drugs on 13 or more days? (b) During the past 90 days, have you gotten drunk or been high for most of 1 or more days? (c) During the past 90 days, has your alcohol or drug use caused you not to meet your responsibilities at work/school/home on 1 or more days? (d) During the past month, has your substance use caused you any problems? (e) During the past week, have you had withdrawal symptoms when you tried to stop, cut down, or control your use? (f) Do you feel that you need to return to treatment? These criteria for need are internally consistent ($\alpha = .85$), and the average person in need endorsed 3.3 of 6 of the items (80% endorsed 2 or more).

Note: GAIN = Global Appraisal of Individual Needs.

Table 2Proportion of Sample Meeting Criteria for Various *DSM-IV-TR* Diagnoses by Complexity of Co-Occurring Disorders^a

	Substance Plus Internalizing ^b	Substance Plus Internalizing Plus Externalizing	Total	<i>p</i>
Number of people	295	230	340	865
Row percentage	34	27	39	100
Any past-year internal disorder	—	100	100	66
Depressive disorder	—	77	93	57
Anxiety disorder	—	56	75	44
Trauma-related disorder ^c	—	35	73	38
Any past-year external disorder	—	—	100	39
Attention deficit hyperactivity disorder (ADHD) ^d	—	—	76	30
Conduct disorder (CD) ^e	—	—	76	30
Pathological gambling	—	—	13	5
Number of mental disorders ^f				
None	100	—	—	34
One	—	45	0	12
Two	—	36	9	13
Three or more	—	19	91	41
<i>M (SD)</i>	0.00 (0.00)	1.73 (0.76)	4.05 (1.04)	2.04 (1.90)

Note: *DSM-IV-TR* = *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text revision; American Psychiatric Association 2000).^a Cell values are in column percentages (%) or mean (standard deviation).^b There were insufficient numbers of “external only” to break out, as discussed in the “Method” section.^c Includes posttraumatic distress, acute traumatic distress, and other disorders of extreme stress (e.g., ongoing maltreatment).^d Includes inattentive type, hyperactive type, and combined type.^e Although required historically before the age of 15 for antisocial personality disorder, here it is based on the “past year” to identify adults who are currently acting out.^f Count of the types of seven mental disorders (depression, anxiety, trauma, ADHD, CD, pathological gambling).

Table 3Demographic and Treatment-Related Characteristics by Complexity of Co-Occurring Disorders^a

	Substance	Substance Plus Internalizing	Substance Plus Internalizing Plus Externalizing	Total	<i>p</i>
Number of people	295	230	340	865	
Row percentage	34	27	39	100	
Demographics					
Female	47	56	56	53	.036
African American	85	83	80	82	.004
Age	36.8 (8.2)	38.3 (8.2)	37.3 (7.8)	37.4 (8.1)	.097
Married/living with someone	17	15	15	16	.584
Employed	33	25	34	31	.056
Ever homeless/runaway	36	59	76	57	.000
Past-month homelessness	17	30	41	30	.000
Crime/violence					
Current criminal justice involvement	37	27	34	33	.063
Controlled environment	47	64	65	58	.000
Illegal Activity Scale ^b	0.07 (0.15)	0.08 (0.15)	0.19 (0.25)	0.12 (0.20)	.000
Ever been victimized	52	74	91	73	.000
Physical health					
Health Distress Scale ^c	3.04 (2.8)	5.07 (2.9)	6.06 (3.0)	4.77 (3.2)	.000
Health Problem Scale ^b	0.08 (0.16)	0.13 (0.22)	0.19 (0.26)	0.14 (0.23)	.000
Sexual Risk Scale ^d	2.85 (1.6)	3.52 (2.2)	4.45 (2.3)	3.66 (2.2)	.000
Lifetime physical health treatment	95	96	99	97	.031
Current Health Service Use Index ^b	0.10 (0.27)	0.09 (0.24)	0.11 (0.26)	0.10 (0.26)	.660
Substance use/dependence					
Weekly alcohol or drug use	73	83	86	81	.000
First use under 15 years of age	31	35	45	38	.000
Any lifetime substance disorder (including abuse)	100	100	100	100	—
Any lifetime dependence	78	98	99	92	.000

	Substance	Substance Plus Internalizing	Substance Plus Internalizing Plus Externalizing	Total	<i>p</i>
Alcohol dependence	20	29	44	32	.000
Cannabis dependence	4	8	9	7	.036
Cocaine dependence	49	72	77	66	.000
Opioid dependence	22	30	32	28	.016
Other dependence	1	1	4	2	.005
Number of lifetime dependence diagnoses					
1 dependence diagnosis	59	62	48	55	.000
2 dependence diagnoses	16	31	38	28	
3 + dependence diagnoses	2	5	13	7	
<i>M(SD)</i>	0.96 (0.7)	1.40 (0.6)	1.66 (0.8)	1.35 (0.8)	.000
Number of previous treatment episodes					
0	46	38	24	35	.000
1	22	24	20		
2+	33	39	56	43	
<i>M(SD)</i>	1.32 (1.8)	1.47 (1.7)	3.21 (6.2)	2.10 (4.2)	.000
<i>M(SD)</i> Current Substance					
Abuse Treatment Index ^b	0.04 (0.14)	0.05 (0.16)	0.07 (0.21)	0.05 (0.18)	.041
Treatment motivation/pressure					
Problem Recognition Index ^e	29.82 (9.0)	34.93 (7.0)	37.54 (6.4)	34.16 (8.3)	.000
Desire for Help Index ^f	28.51 (6.1)	31.66 (4.1)	33.01 (3.0)	31.09 (4.9)	.000
Internal Motivation Index ^g	19.79 (3.7)	21.71 (3.0)	22.06 (2.6)	21.18 (3.3)	.000
External Pressure Index ^h	16.71 (4.6)	17.30 (4.3)	17.86 (4.8)	17.31 (4.6)	.012
Access Barrier Index ⁱ	17.82 (5.1)	18.26 (5.9)	18.24 (5.8)	18.10 (5.6)	.596
Self-Efficacy Index ^g	17.29 (4.3)	15.55 (4.3)	14.91 (4.6)	15.91 (4.5)	.000
Mental health					
Emotional Problems Scale ^b	0.06 (0.08)	0.20 (0.17)	0.44 (0.22)	0.24 (0.24)	.000
Any prior mental health treatment	8	27	47	28	.000
Mental Health Services Use Index ^b	0.02 (0.12)	0.04 (0.18)	0.09 (0.26)	0.05 (0.20)	.000

Note: Chi-squares used to test significance on categorical variables; ANOVA used to test mean differences.

^aCell values are in column percentages (%) or mean (standard deviation).

^bProportional scales ranging from 0 to 1.

^cHealth Distress Scale ranges from 0 to 14.

^dSexual Risk Scale ranges from 0 to 12.

^eProblem Recognition Index ranges from 9 to 45.

^fDesire for Help Index ranges from 7 to 35.

^gInternal Motivation Index and Self-Efficacy Index range from 5 to 25.

^hAccess Barrier Index ranges from 8 to 40.

ⁱExternal Pressure Index ranges from 6 to 30.

Impact of Recovery Management Checkup by Complexity of Co-Occurring Mental Disorders

Table 4

Variable	Total			Substance			Substance Plus Internalizing			Substance Plus Internalizing Plus Externalizing		
	RMC (<i>n</i> = 426)	Control (<i>n</i> = 427)	Cohen's <i>d</i> ^a	RMC (<i>n</i> = 156)	Control (<i>n</i> = 135)	Cohen's <i>d</i> ^a	RMC (<i>n</i> = 106)	Control (<i>n</i> = 119)	Cohen's <i>d</i> ^a	RMC (<i>n</i> = 164)	Control (<i>n</i> = 173)	Cohen's <i>d</i> ^a
Return to treatment												
Percentage with any subsequent treatment ^b	59	45	.33 *	49	33	.23 *	62	53	.38 *	63	47	.31 *
Reduced days to readmission ^b	-294 days		.31 *	-330 days		.34 *	-228 days		.26 *	-343 days		.34 *
Treatment exposure												
Mean days in treatment	59	39	.24 *	41	35	.08	73 *	29	.58 *	66	50	.18
Percentage in treatment for 90+ days	26	18	.18 *	15	16	-.02	36	11	.52 *	30	23	.15
Treatment outcomes												
Total days abstinent	489	462	.16 *	476	475	.00	479	463	.09	501	450	.30 *
Number of successive quarters of unmet need for treatment	2.2	2.9	-.21 *	2.5	2.9	-.16	2.3	2.8	-.21	2.0	2.9	-.36 *
Need for treatment at 24 months ^a	40	51	-.23 *	39	48	-.20	42	49	-.16	40	52	-.28 *

Note: RMC = Recovery Management Checkups.

^aBased on Cox Regression; effect size estimates with two arcsine transformation for any treatment and from chi-square for reduced days to readmission.^bPercentage who were in the community and self-reporting use/problems/need for treatment or positive on urine tests at the 24-month or last available interview.* *p* < .05.