

The Efficacy of Case Management With Persons Who Have Substance Abuse Problems: A Three-Level Meta-Analysis of Outcomes

Richard C. Rapp
Wright State University

Wim Van Den Noortgate
University of Leuven

Eric Broekaert and Wouter Vanderplasschen
Ghent University

Objective: Case management has been widely used as an intervention in the treatment of substance abuse problems. Its effectiveness has been associated with over 450 outcomes, some consistent with case management's traditional functions of linking (treatment tasks) and others typical of treatment outcomes such as substance use (personal functioning). **Method:** Meta-analyses were conducted on 21 randomized clinical trials in which we compared the efficacy of case management with standard-of-care conditions and active interventions. Characteristics of case management—including targeted outcomes, case management model, location on the treatment continuum, and intervention quality—were treated as moderators, as were 2 study features, length of follow-up, and methodological quality. **Results:** Results showed that case management was efficacious across all targeted outcomes when compared with standard of care ($\hat{\delta} = 0.15$, $SE = 0.037$), although the overall effect was weak. There was a significant difference, $F(1, 429) = 25.26$, $p < .0001$, between case management's effect on treatment task outcomes such as linking with and staying in treatment ($\hat{\delta}_2 = .29$, $p = .001$) and improving individuals' functioning of persons with substance abuse problems in areas such as substance use and HIV risk behaviors ($\hat{\delta}_1 = 0.06$, $p = .05$). Moderator analyses demonstrated that (a) 4 case management models were more effective than standard of care in improving treatment task outcomes and (b) case management was effective either in or out of treatment. **Conclusions:** Our results demonstrate that case management is effective across a wide range of treatment task outcomes, but more limited in its effectiveness with personal functioning outcomes.

Keywords: case management, addiction, linkage, retention, systematic review, treatment

Case management is a ubiquitous social service intervention implemented to assist individuals with a wide range of challenges in accessing needed services. The core functions of case management include assessment of major life challenges, development of a plan of action that includes community resources, linking, and monitoring involvement with resources and advocating on behalf of individuals (Center for Substance Abuse Treatment, 1998; National Association of Social Workers, 2012). Although originally developed to assist persons with mental illness, case management has been successfully adapted for use with persons who have substance use disorders and significant related problems such as poor health, substandard housing, and legal difficulties (Vanderplasschen, Wolf, Rapp, & Broekaert, 2007). Case management has been implemented to address multiple populations of persons with

substance abuse problems, including female welfare recipients (Morgenstern et al., 2006; Morgenstern, Hogue, Dauber, Dasaro, & McKay, 2009), homeless persons (Cox et al., 1998; de Vet et al., 2013), dually diagnosed patients (Jerrell & Ridgely, 1995; Morse et al., 2006), crack cocaine users (Rapp et al., 2008; Rapp, Siegal, Li, & Saha, 1998), HIV-infected drug users (Sorensen et al., 2003), and opiate-dependent persons in methadone treatment (Zanis, McLellan, Alterman, & Cnaan, 1996). The widespread acceptance of case management in treating substance use disorders is reinforced by the view that case management is an important component of the substance abuse treatment continuum (Center for Substance Abuse Treatment, 1998), an integral part of specific treatment interventions (Carroll & Schottenfeld, 1997), and a crucial component in the treatment of addictions (National Institute on Drug Abuse, 1999).

This article was published Online First May 12, 2014.

Richard C. Rapp, Boonshoft School of Medicine, Wright State University; Wim Van Den Noortgate, Faculty of Psychology and Educational Sciences, University of Leuven; Eric Broekaert, and Wouter Vanderplasschen, Department of Special Education, Ghent University.

Correspondence concerning this article should be addressed to Richard C. Rapp, Boonshoft School of Medicine, Wright State University, 5735 Swan Drive, Dayton, OH 45315. E-mail: richard.rapp@wright.edu

Case Management Characteristics

Although the core functions of case management remain consistent, several characteristics of the intervention vary across implementations. Characteristics that are frequently adapted include targeted outcomes, practice model, and location on the continuum of care.

Targeted Case Management Outcomes

Case management has been expected to influence numerous outcomes in clinical trials (Hesse, Vanderplasschen, Rapp, Broekaert, & Fridell, 2007). Substance use and criminal justice involvement are almost universally found among case management outcomes, given their importance as evidence of recovery. Assessment of the effect that case management has on substance use outcomes is made difficult by the presence of numerous measures recognized as indicators of substance abuse functioning in case management trials, including widely used instruments such as the Addiction Severity Index (McLellan et al., 1992) and the Maudsley Addiction Profile (Marsden et al., 1998), and measures unique to a single trial (Hesse et al., 2007). Criminal justice involvement is somewhat easier to verify given the public nature of court records, although here, too, self-report remains the most common approach to assessing wrong.

Also, case management has been expected to improve outcomes as diverse as reducing high-risk sexual and drug-using behavior (Martin & Scarpitti, 1993; Rhodes & Gross, 1997), enhancing quality of life (Drake et al., 1998; Karow et al., 2010), improving living situation (Calsyn, Yonker, Lemming, Morse, & Klinkenberg, 2005), reducing psychiatric symptoms (Drake et al., 1998), improving occupational functioning (Cox et al., 1998; Siegal, Fisher, Rapp, & Kelliher, 1996), enhancing social stability (Jerrell & Ridgely, 1995b), and improving parenting skills (Dakof et al., 2010; Suchman et al., 2010). In addition to these clinical outcomes, case management is widely expected to improve treatment task outcomes such as improving linkage rates with and retention in treatment (Mejta, Bokos, Mickenberg, Maslar, & Senay, 1997; Scott, Sherman, Foss, Godley, & Hristova, 2002), increasing treatment participation and engagement, and enhancing follow-through with aftercare services (Siegal, Rapp, Li, Saha, & Kirk, 1997).

Practice Models

Varying approaches to substance abuse case management have included *intensive* (Morgenstern et al., 2006), *low intensity* (Rosenheck, Neale, & Mohamed, 2010), *outreach* (Coviello, Zanin, Wesnoski, & Alterman, 2006), *clinical* (Downey & Braude, 2005; McLellan et al., 1999), *strengths-based* (Brun & Rapp, 2001; Siegal et al., 1995), *brokerage* (Falck, Carlson, Price, & Turner, 1994), *integrated* (Halfon, Berkowitz, & Klee, 1993), and *comprehensive* (Heinemann, Corrigan, & Moore, 2004). Frequently, only the designation *case management* is used to describe the intervention. Regardless of the specific label used to identify case management, numerous clinical trials do not provide working descriptions of the intervention.

Four widely recognized models, differentiated by the intensity of services provided, include brokerage, generalist, strengths-based, and wraparound, or Assertive Community Treatment (ACT; Center for Substance Abuse Treatment, 1998; Vanderplasschen, Rapp, Wolf, & Broekaert, 2004). Brokerage case management is the least intensive model of case management, consisting of little personal interaction between the professional providing case management services and a client. Assistance is limited to helping clients identify their needs and passive referral, all in one or two contacts (Stahler, Shipley, Bartelt, DuCette, & Shandler, 1995). The opposite end of the intensity spectrum is characterized by

wraparound case management, usually in the form of ACT (Stein & Test, 1980). ACT offers an unlimited number of contacts between the individual substance abuser and a multidisciplinary team of professionals (Bond, Drake, McHugo, Rapp, & Whitley, 2009). Services may be provided directly by the ACT team or by referral to other resources. ACT case management is frequently used with persons who have coexisting substance abuse and mental health problems (Drake et al., 1998). Generalist case management provides the traditional functions of case management—assessment, planning, linking, monitoring, and advocacy—and is usually characterized by a close involvement between case manager and client. The structure of case management—frequency of contacts, duration of services—may vary widely. Strengths-based case management provides the core functions of case management but is guided by a set of principles that emphasize assessment of client strengths, client-driven goal setting, and assertive outreach (Rapp, 2006). This approach is based on the view that persons who have substance abuse problems are more likely to be successful when they identify personal abilities and strengths rather than deficiencies and pathology.

Role in the Continuum of Care

Case management's implementation along the substance abuse continuum of care is made necessary in many settings by poor coordination and continuity of services and failure to ensure that individuals negotiate the gap between services (Vanderplasschen et al., 2004). Out-of-treatment opiate-dependent individuals have frequently been the target population for case management (Corsi, Kwiatkowski, & Booth, 2007; Coviello et al., 2006; Sorensen et al., 2005). Persons with substance abuse problems who were assessed but had not yet attended their first clinical appointment have received services from case managers in centralized intake units (Carr et al., 2008; Scott et al., 2002). In-treatment case management has stressed retention in treatment as well as improvement in substance use, criminal justice involvement, and a variety of other outcomes (Conrad et al., 1998; Cox et al., 1998; Saleh et al., 2003). In order to maintain gains made while in treatment, case management has also received attention as an important part of the aftercare period (Siegal, Li, & Rapp, 2002). Given the legal involvement of many persons with substance abuse problems, case management has also been provided along a continuum of criminal justice interventions, from preincarceration probation (Guydish et al., 2011) to parole for persons returning to the community from prison (Martin & Scarpitti, 1993; Prendergast et al., 2011).

The Current Study

The meta-analysis of substance abuse case management presented here builds on an earlier analysis published in the Cochrane Database of Systematic Reviews that revealed case management was significantly more effective than standard-of-care conditions in improving outcomes (Hesse et al., 2007). In the current study, we sought to examine that finding in more depth by adding seven clinical trials, increasing the number of trials from 14 to 21, and the number of targeted outcomes from slightly over 300 to 455. Further, we addressed the issue of whether case management has differential effects on two types

of treatment outcomes, treatment tasks, and personal functioning. Moderators in this study included four characteristics of case management—type of outcome, practice model, location of case management on the treatment continuum, and intervention quality. Two study features—duration of follow-up period and methodological quality—were also included as moderators. The three-level meta-analysis used in this study allowed us to investigate the consistency of case management's effect across outcomes and look for the effects of moderators.

Method

Search Strategy

The search for studies of case management with persons who have substance abuse problems was based on both electronic and manual searches recommended by the Cochrane Drugs and Alcohol Group (<http://cdag.cochrane.org/resources-review-authors>) using the following search terms and Boolean operators: *case management* (OR *continui *care*) AND *addict ** (OR *drug [ab]use* OR *drug dependen ** OR *substance [ab]use* OR *substance dependen **, AND *controlled stud ** [OR *controlled trial* OR *randomized trial* OR *experimental design*]). Searches included the following fields: title, abstract, and key words of publications. Electronic searches were conducted in the following databases from their inception through 2012: (a) The Cochrane Central Register of Controlled Trials (CENTRAL - The Cochrane Library, most recent), which includes the Cochrane Drugs and Alcohol Groups specialized register; (b) MEDLINE; (c) EMBASE; (d) CINAHL; (e) LILACS; (f) PsycLIT; (g) Toxibase (www.toxibase.org); (h) Web of Science; (i) PubMed; and (j) clinicaltrials.gov. In addition, manual searches of reference lists of retrieved studies, reviews, meta-analyses, and conference abstracts were conducted.

National focal points for drug and alcohol research, such as the National Institute on Alcohol Abuse and Alcoholism, National Institute on Drug Abuse, National Drug and Alcohol Research Centre, and European Monitoring Centre for Drugs and Drug Addiction, were contacted for information and advice concerning past and ongoing randomized trials of case management with substance users. Authors of studies and experts in substance abuse and case management in various countries were contacted to find out whether they were aware of clinical trials that assessed the effectiveness of case management with persons who have substance use disorders. Personal contacts with authors provided the opportunity to ask about grey literature studies, that is, studies that were conducted but never published. There were no language or publication year restrictions.

Selection of Clinical Trials

All abstracts and articles were reviewed independently by three of the study authors (RR, WV, EB), all of whom have published extensively about case management and served as experts on the topic in the United States (RR) and Europe (WV, EB). Five criteria were used to assess the eligibility of each clinical trial for the meta-analyses.

- Study design had to be a clinical trial, a research design that answers specific questions about behavioral interventions and determines whether the behavioral intervention is safe, efficacious,

and effective (National Institutes of Health, 2013). Specifically, a controlled design had to be used in the eligible clinical trials in which participants were randomly assigned to case management and a comparison condition. The comparison condition could be a standard of care, active intervention, or a second case management model.

- The entire sample had to consist of persons with substance use disorders, either abuse or dependence. All participants could have a drug of abuse or dependence in common or be using different substances from other members of the sample. Studies including people with co-occurring conditions, such as psychiatric disorders, were eligible if it was clear that substance use disorders were present in the entire sample.

- Descriptions and definitions of case management had to include at least four of the five basic functions commonly associated with the intervention—assessment, planning, linking, monitoring, and advocacy (Center for Substance Abuse Treatment, 1998; National Association of Social Workers, 2012)—and/or the intervention had to be labeled as case management by the investigators.

- Only studies in which the comparison group was a psychosocial intervention were eligible. The decision to eliminate pharmacological interventions was based on the very different mechanisms of action present in the two types of intervention.

- Case management was not combined with another intervention and delivered together, unless it was possible to statistically disentangle the results attributable to case management alone. An example of a combined intervention was case management combined with motivational interviewing as a single intervention; results did not distinguish the separate effects of case management and motivational interviewing (Karow et al., 2010).

Figure 1 provides a summary of the attrition of articles through the selection process. One hundred thirty-five complete articles, reports, and unpublished manuscripts were retrieved from electronic and manual searches, and unanimous agreement was reached on the eligibility of 38 articles from 22 clinical trials (see Table 1). Seven articles were eliminated because they did not present results in a form where effect sizes could be calculated, leaving 31 articles from 21 clinical trials retained for analysis.

Data Extraction and Preparation

Case management and comparison conditions. Among eligible trials, case management was compared with standard of care in 18 trials and with active interventions in three. *Standard of care* consisted of the usual and customary practices provided in a treatment setting, optimally with the best practices available (National Institutes of Health, 2013). In clinical trials, standard-of-care conditions serve as the baseline with which to compare an experimental intervention's effects. The standard-of-care services in meta-analysis studies varied widely in intensity, from a nonintensive paper referral (Coviello et al., 2006) and passive referral-HIV/AIDS education (Sorensen et al., 2003) to more intensive examples, including community care coordination (Morgenstern et al., 2006) and standard parole supervision and referral services (Gyudish et al., 2011; Prendergast et al., 2011).

In other studies, *active interventions* were included to assess their effectiveness relative to case management. Active interventions also varied, from motivational interviewing combined with risk reduction strategies to extensive parenting programs (Dakof et

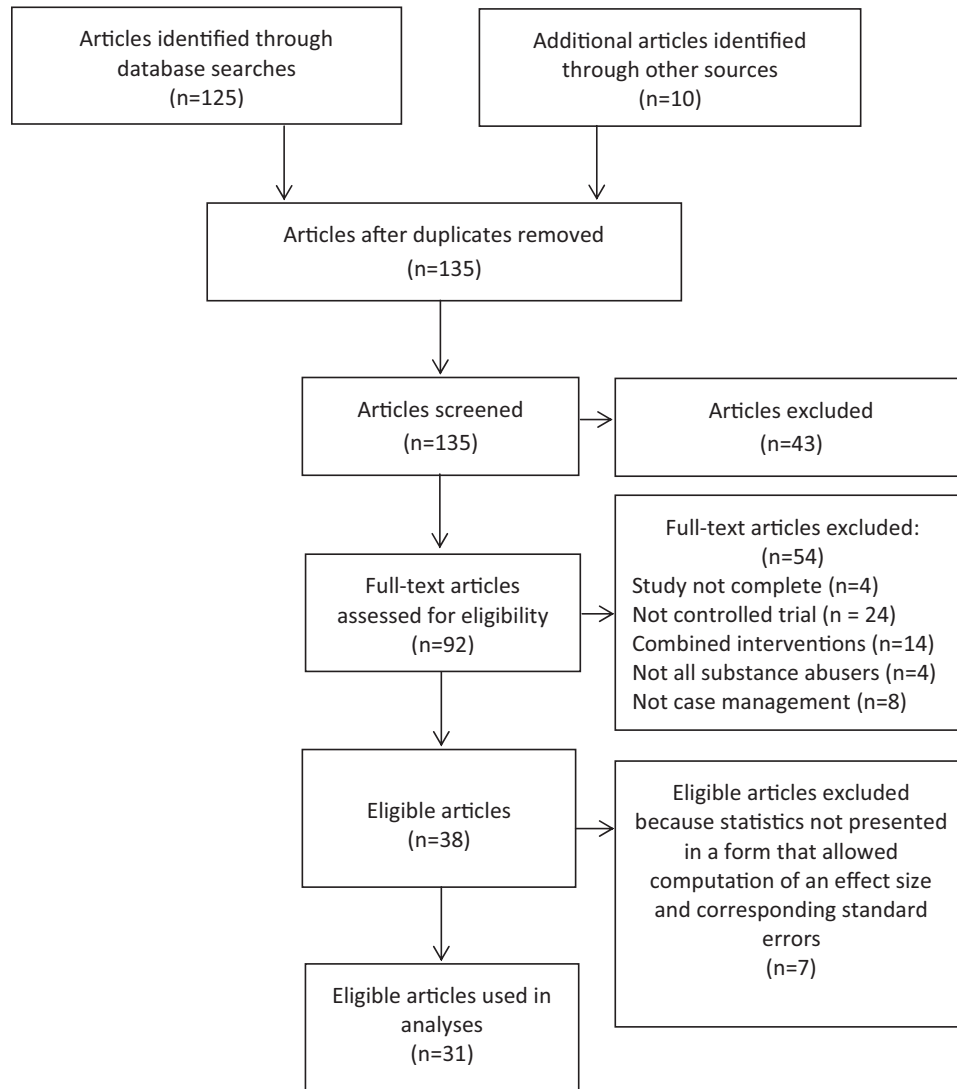


Figure 1. PRISMA flow diagram for substance abuse case management articles (Moher, Tetzlaff, & Altman, 2009). The term *article* signifies published articles and reports, unpublished manuscripts, abstracts, and the like.

al., 2010; Suchman et al., 2010). We retained the authors' labels of a comparison as standard of care or active intervention, although the differences between the two were not always obvious.

In two of the 21 trials, case management was compared with both a standard of care and an active intervention; motivational interviewing in one trial (Carr et al., 2008; Rapp et al., 2008) and treatment vouchers in another (Barnett, Masson, Sorensen, Wong, & Hall, 2006; Sorensen et al., 2005). In two of the trials, models of case management were compared with one another (Essock et al., 2006; Jansson, Svikis, Breon, & Cieslak, 2005; Manuel, Covell, Jackson, & Essock, 2011).

Moderator variables. Three of the study authors (RR, WV, EB) coded moderator variables on the basis of the criteria outlined below.

Targeted outcomes. Four hundred fifty outcomes were present in the 21 clinical trials. Results from the earlier Cochrane review (Hesse et al., 2007) suggested that the effectiveness of case man-

agement varied across outcomes, possibly depending on whether an outcome described a task of substance abuse treatment or changes in individual functioning. From this preliminary finding, two categories of outcomes were created, one representing *treatment tasks* and the other *personal functioning*. One hundred twenty treatment tasks outcomes were identified in five domains: linkage with substance abuse services, retention in substance abuse services, linkage with ancillary services, retention in ancillary services, and satisfaction with treatment. Three hundred thirty-five personal functioning outcomes were assigned to substance use (alcohol and drugs), risk behaviors (drug and sex), legal/criminal justice status, health status (mental and physical), and social inclusion (employment, family functioning, and housing).

Case management models. The case management model was selected as a potential moderator to determine whether differences in service intensity influenced effectiveness. Comparing models' intensity was made difficult by some characteristics of the case

Table 1
Basic Characteristics of Eligible Randomized Trials of Case Management Used With Persons Who Have Substance Abuse Problems

Study*	Substance/population**	Setting	Tx status***	Case management model****	Study-specified comparison condition	Manual/supervision	Longest follow-up (mos.)	MQS
Case management compared with standard-of-care conditions								
Martin & Scarpitti (1993)	Polysubstance; parolees	State correction facilities	Out	ACT	Usual parole	N/N	6	11
Braucht et al. (1995)	Polysubstance; homeless	Drop-in center; homeless shelter	In	Generalist	SOC	N/N	6	5
Stahler et al. (1996)+	Polysubstance; homeless; males	Homeless shelters	Out	Generalist	SOC	N/N	6	10
Siegal et al. (1996)+; Rapp et al. (1998); Siegal et al. (2002)	Polysubstance; males	Residential tx program	In	Strengths	Passive referral	N/N	6	14
Zanis et al. (1996)	Injectable drug users	Community	Out	Brokerage	Paper referral	Y/N	1	12
Rhodes & Gross (1997)	Polysubstance; arrestees	Lock-ups; booking facilities	Out	Generalist	Video/referral list	N/N	6	11
Drake et al. (1998); Essock et al. (2006); Manuel et al. (2011)	Dually diagnosed	Mental health centers	In	ACT	Standard clinical case management	N/N	36	17
Cox et al. (1998)	Alcoholics; homeless	Alcohol detox programs	Out	Generalist	Community services	N/N	18	10
Vaughan-Sarrazin et al. (2000); Vaughan-Sarrazin et al. (2001)+; Saleh et al. (2003)+; Vaughan-Sarrazin et al. (2004)+; Saleh et al. (2002); Saleh et al. (2006); Hall et al. (2009)	Polysubstance	Substance abuse treatment programs	In	Strengths	SOC	N/N	12	10
Scott et al. (2002)	Polysubstance	Centralized intake unit	Out	Generalist	SOC	N/Y	6	11
Sorensen et al. (2003)	Injectable drug users; HIV positive	Medical wards, ER, detox unit	Out	Generalist	Passive referral and HIV/AIDS education	Y/Y	18	14
Sorensen et al. (2005); Barnett et al. (2006)	Injectable drug users	ERs; wound clinics	Out	Generalist	SOC	Y/N	6	14
Calsyn et al. (2005)+; Morse et al. (2006)	Dually diagnosed; homeless	Shelter; soup kitchen; street	Out	ACT	Integrated treatment	Y/Y	24	13
Jansson et al. (2005)	Polysubstance; pregnant women	Community hospitals	Out	Generalist	Brokerage	N/Y	4	10
Coviello et al. (2006)	Injectable drug users	Methadone program	Out	Brokerage	Paper referral	Y/Y	6	13

(table continues)

Table 1 (continued)

Study*	Substance/population**	Setting	Tx status***	Case management model****	Study-specified comparison condition	Manual/supervision	Longest follow-up (mos.)	MQS
Morgenstern et al. (2006); Morgenstern, Hogue, et al. (2009); Morgenstern, Neighbors, et al. (2009); Dauber et al. (2012)	Mothers in child welfare system	Welfare offices	Out	Generalist	Usual community coordination	Y/Y	15 15 24 48	15
Carr et al. (2008)+; Rapp et al. (2008)	Polysubstance	Centralized intake unit	Out	Strengths	Active referral	Y/Y	6	12
Prendergast et al. (2011)	Polysubstance; parolees	State correction facilities	Out	Strengths	Standard referral	Y/Y	9	14
Guydish et al. (2011)	Female probationers	Probation offices	Out	Generalist	Usual probation	Y/Y	12	12
Case management compared with active interventions								
Sorensen et al. (2005)	Injectable drug users	ERs; wound clinics	Out	Generalist	Treatment voucher	Y/N	6	14
Barnett et al. (2006)	Injectable drug users; homeless	Street	Out	Generalist	Motivational interviewing/risk reduction	N/N	6	4
Carr et al. (2008)+; Rapp et al. (2008)	Polysubstance	Centralized intake unit	Out	Strengths	Motivational interviewing	Y/Y	6	12
Dakof et al. (2010)	Mothers in dependency drug court	Probation offices	In	Generalist	Engaging Moms Program	N/Y	18	13
Suchman et al. (2010)	Mothers with children 3 and under	Treatment program	In	Generalist	Mothers & Toddlers Program	Y/N	8	14

Note. Tx = treatment; MQS = Methodological Quality Scale; ACT = Assertive Community Treatment; SOC = standard of care; ERs = emergency rooms.

* Study reports are combined with others from the same clinical trial. Clinical trials are listed in order of the earliest study report. ** "Polysubstance" indicates that not all participants in the study had the same type of substance abuse problem(s). *** Status of substance abuser at time of entry into case management. **** Model as categorized by reviewers. +Not included in analyses; results are not presented in a form suitable for calculating effect sizes.

management trials. Several studies provided no working definition or description of case management. Given these difficulties, the authors collapsed case management into four widely recognized categories: brokerage, generalist, strengths-based, and wraparound or ACT (Center for Substance Abuse Treatment, 1998; Vanderplasschen, Wolf, Rapp, & Broekaert, 2007). The primary rule for placing the case management model in a category was to follow investigators' explicit designation. When there was no explicit statement about the type of case management, it was assigned to a model on the basis of investigators' descriptions of the intervention.

Continuum location. On the basis of the participants' status when they were recruited into a trial, the location of case management was identified as either in or out of treatment. The in-treatment designation was applied whether individuals were in a substance abuse treatment program or mental health services.

Intervention quality. None of the eligible studies included fidelity measurements that would indicate how closely implementation of the intervention conformed to how it was designed. Lacking this measure, we created a moderator of *intervention quality*. A trial was coded as having intervention quality if an implementation manual had been written or structured, ongoing supervision was described. Trials that did not report having a manual or supervision were assumed to not have these characteristics.

Study feature moderators. Length of study follow-up was included as a moderator to investigate whether the effect of case management changed over time. These moments were categorized in the following categories: 3 months, 6 months, 9 months, 12 months, 15 months, 18 months, and 24 months or more. Follow-up periods ranged from 1 to 48 months.

Methodological quality was assessed using the Methodological Quality Scale (Miller & Wilbourne, 2002) and included as a moderator variable. Quality scores range from minimal quality, "0," to maximum quality, "24."

Reporting and publication bias. Reporting and publication bias are potential sources of uncertainty in any meta-analysis, as they reflect the tendency for available research to favor interventions supported by study authors (Vevea & Woods, 2005). A reporting and publication bias emerges when statistically significant effects are more likely to be reported and published than nonsignificant effects, leading to an inflated overall effect size. In case of bias, we would expect a relationship between the observed effect sizes and the corresponding standard errors. To check for publication and reporting bias, we used the Egger's regression intercept test (Egger, Smith, Schneider, & Minder, 1997). Moreover, we applied the Duval and Tweedie's trim and fill method (Duval & Tweedie, 2000) to make an effect estimate corrected for publication bias. These analyses and tests were done in *Comprehensive Meta-Analysis* (CMA; Borenstein, Hedges, Higgins, & Rothstein, 2005).

Analysis

Before being combined and compared, reported data were converted to a common metric. We used the standardized mean difference, δ , to express the size of effect, assuming a common standard deviation for the case management and comparison conditions. Sometimes this measure could be computed directly, in

other cases data were derived from test statistics, p values or other effect size metrics such as odds ratio's and correlation coefficients. Besides estimating δ for each outcome reported in a trial, we also estimated its corresponding standard error, because these standard errors were used in the meta-analysis to determine the weight of each effect size and to estimate the precision of the estimates of the parameters of our meta-analytic model (Hedges, 1981). All calculations and conversions were computed using the CMA software.

Most meta-analytic methods assume that effect sizes that are combined are statistically independent. In our meta-analysis, however, there were several sources of dependence. Ignoring these dependencies would lead to flawed statistical inferences: too small standard errors resulting in too many Type I errors (the null hypothesis is too easily rejected) and too small confidence intervals (estimates are less accurate than suggested by the confidence intervals) (Becker, 2000). Therefore, we used a three-level meta-analytic model to deal with the dependence, that is, with the overlap in information given by effect sizes from the same study (Van den Bussche, Van den Noortgate, & Reynvoet, 2009; Van den Noortgate, Lopez-Lopez, Marin-Martinez, & Sanchez-Meca, 2012). In this way, estimated standard errors are still appropriate, and power and accuracy are not artificially inflated. This model accounts for three sources of variance: among-study variance (systematic differences among studies in the effect over outcomes), among-outcomes variance (systematic differences within studies among effects for multiple outcomes), and sampling variance (referring to deviations of the observed effect sizes from the population effect sizes, due to the fact that in a study, only a sample of participants was included). The advantage of the three-level approach is that it does not require aggregating the effect sizes within the studies, and therefore we gain insight not only in differences among studies but also in the consistency of effect estimates within studies and can further study a possible within-study heterogeneity by looking for within-study moderator variables.

Parameters of the three-level meta-analytic models were estimated, using restricted maximum likelihood estimation, implemented in the mixed procedure from SAS (Littell, Milliken, Stroup, Wolfinger, & Schabenberger, 2006). The mean and the moderating effects were statistically tested by comparing the ratio of the estimate over the corresponding standard error estimate to a t distribution, with degrees of freedom estimated using the Satterthwaite method (Satterthwaite, 1946). A likelihood ratio test was used for testing the (residual) heterogeneity among outcomes and among studies (Raudenbush & Bryk, 2002).

Besides the use of a three-level model, we performed separate analyses for clinical trials comparing case management with a standard-of-care condition and with an active intervention condition. Because only five studies were available, moderator variables were not applied to comparisons of case management and active interventions.

Results

Observed effect sizes for 119 of the 120 treatment task outcomes ranged from -0.64 to 1.93 , with a median of 0.14 . One confidence interval had extremely large limits [$6.09, 8.08$], which were far outside the range of the other values. This outlier, the effect on nonsubstance abuse treatment tasks found in Prendergast et al. (2011), was not excluded from the first analysis, because it had little effect on the results. It was

excluded from the moderator analyses, because we found that this outlier had a large impact on the estimated moderator effects. Thirty-one observed effect sizes are smaller than zero, one equal to zero, and 87 larger than zero. Thirty observed effect sizes are significantly larger than zero, only one significantly smaller than zero. Effect sizes of .20, .50, and .80 refer to, respectively, small, moderate, and large effects (Cohen, 1992).

Observed effect sizes of 335 personal functioning outcomes ranged from -2.90 to 2.19, with a median of 0.030. One hundred thirty-two observed effect sizes were smaller than zero, 19 were exactly equal to zero, and the remaining 184 effect sizes were larger than zero. Only 23 observed effect sizes were significantly larger than zero (if tested on a .05 significance level), whereas 11 effect sizes were significantly smaller than zero.

Because studies typically reported multiple outcomes for which effect sizes could be calculated, and effect sizes from the same study were likely to be more similar, we also summarized the effect sizes in a forest plot with one confidence interval per clinical trial. See Figure 2.

Case Management and Standard-of-Care Condition

In the initial three-level analysis, we included all 18 clinical trials that contained a comparison of case management and standard of care. We found an estimate of the overall effect (δ) equal to 0.15, with a standard error of 0.037. This effect can be considered as small, although it is statistically significant, $t(13.7) = 3.97$, $p = .001$.

A three-level approach allowed us to assess heterogeneity among studies, as well as heterogeneity among outcomes within the same study. We found statistically significant variation among studies, $\hat{\sigma}^2 = 0.018$, $\chi^2(1) = 73.5$, $p < .0001$, as well as among outcomes from the same study, $\hat{\sigma}^2 = 0.013$, $\chi^2(1) = 50.2$, $p < .0001$. To interpret the size of these variances, we compared them with the size of the sampling variance, which is the variance at the first level. Because this variance depends on the size of the study, we looked at the median value of the estimated sampling variance, which was equal to 0.026. This means that for typical studies, about 32% of the total variance in observed effect sizes ($0.018 + 0.0134 + 0.026$) is variance among studies, 23% variance among

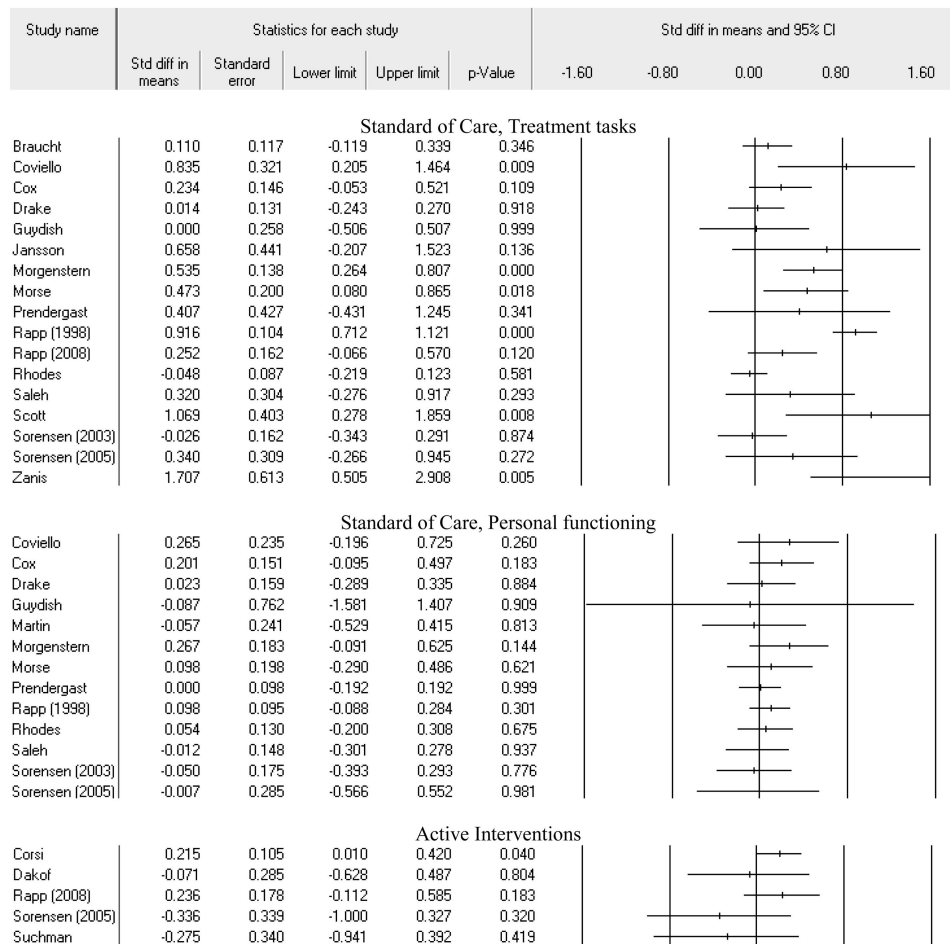


Figure 2. Forest plot of the average observed effect sizes per clinical trial, with the corresponding 95% confidence intervals (CI). Standardized differences (std diff) to the right of .00 favor case management; those to the left of .00 favor the comparison condition. Only first authors are given when only one reference begins with those authors. In other cases, the date clarifies the intended reference. Morgenstern refers to Morgenstern, Hogue, et al. (2009).

outcomes from the same study, and 45% random-sampling variance. We note that the interpretation of these measures is similar to the interpretation of I^2 used when there are only two sources of variation: I^2 refers to the percentage of variance at the study level. The percentages suggest there were substantial differences among outcomes and especially among studies in the size of the effect so that the estimate of the mean effect is less informative. More specifically, based on these estimates and on the assumption of normality at both the study and within-study level, we expected that 95% of the study-specific mean effects range between -0.12 and 0.41 and that for a study with an average effect of 0.15 , 95% of the investigated effects in that study range between -0.08 and 0.37 . Given the size and significance of the variance at the study and outcome level, we therefore explored how this variance can be explained by performing moderator analyses in those studies in which case management was compared with standard-of-care conditions. *Case management and standard of care: Treatment task and personal functioning outcomes

To investigate the difference among treatment tasks and personal functioning, we defined two dummy indicator variables, one for treatment tasks and one for personal functioning, and included these indicators in our meta-analytic model. Seventeen clinical trials contained treatment tasks; 13 trials contained personal functioning outcomes. In this way, we estimated the overall effect for outcomes related to treatment tasks and personal functioning and allowed that the variance among outcomes also depends on the kind of outcome. We assumed a common among-study variance to make the model estimations converge. We found that at the outcome level, case management had a moderate effect on treatment tasks ($\hat{\delta}_2 = .27$), $t(429) = 5.96$, $p < .0001$, and that its effect size for personal functioning outcomes was very weak, although statistically significant ($\hat{\delta}_1 = .07$), $t(429) = 2.44$, $p = .02$. The difference between treatment task and personal functioning outcomes was significant, $F(1, 429) = 25.26$, $p < .0001$. Within studies, there were large differences in effect sizes for treatment tasks, $\hat{\sigma}^2 = 0.104$, but much smaller differences among outcomes regarding personal functioning, $\hat{\sigma}^2 = 0.004$. The estimate of the variance among studies, $\hat{\sigma}^2$, was equal to 0.010 . Both the average effect and the variation in effects were larger for treatment tasks. Because of the apparent differences between the effects on treatment tasks and personal functioning, we decided to continue our analyses separately on treatment task and personal functioning outcomes. Because the one outlying effect size can be influential when estimating effects for specific subcategories of studies, it was not included in the remaining analyses.

Case management and treatment tasks. When treatment tasks were analyzed separately at the study level, the overall treatment effect size estimate, $\hat{\delta}$, was equal to 0.29 , $t(13.7) = 4.11$, $p = .001$. There were no longer differences among outcomes from the same study, $\hat{\sigma}^2 = 0$, but relatively large differences among studies, $\hat{\sigma}^2 = 0.073$, $\chi^2(1) = 60.6$, $p < .0001$, with the proportion of the total variance that is variance at the study level equal to 65%. The upper section of Figure 2 presents the average observed effect sizes for 17 clinical trials in which case management is compared with standard of care on treatment task outcomes.

Moderator effects. The estimated effect for each outcome area is presented on the left side of Figure 3. The effect of case management was largest for retention in substance abuse treatment

($\hat{\delta} = 0.36$, $p = .0002$) and smallest for linkage to ancillary services and satisfaction with treatment ($\hat{\delta} = 0.26$, $p = .002$). Linkage effects for substance abuse treatment was $\hat{\delta} = 0.27$, and for ancillary services retention, it was $\hat{\delta} = 0.31$. The differences among effect sizes for the five outcome types were not significant, $F(4, 114) = 0.84$, $p = .50$.

We found that the effect size estimates were similar for all four case management models and that differences among models were statistically not significant, $F(3, 15.7) = 0.23$, $p = .88$. The estimated effect size was significant for both out-of-treatment ($\hat{\delta} = 0.28$, $p = .01$) and in-treatment groups ($\hat{\delta} = 0.33$, $p = .04$), although the difference between the two treatment groups was not statistically significant, $F(1, 12) = 0.13$, $p = .73$. Moderators that did not have a significant effect are not reported here.

Case management and personal functioning. When analyzing the data regarding personal functioning separately, we found (in line with the overall analysis) a weak average effect: $\hat{\delta}_1 = .06$, an effect that approaches statistical significance, $t(11) = 2.18$, $p = .06$. The middle section of Figure 2 presents the average observed effect sizes for 13 clinical trials in which case management is compared with standard of care on personal functioning outcomes.

Moderator effects. Of the five different personal functioning outcome areas, case management had a statistically significant effect on social inclusion ($\hat{\delta} = 0.09$, $p = .02$), substance use ($\hat{\delta} = 0.08$, $p = .01$), and risk behaviors ($\hat{\delta} = 0.09$, $p = .04$). There were significant differences among the effects for the five outcome types, $F(4, 185) = 2.73$, $p = .03$. Estimates and corresponding 95% confidence intervals are given in Figure 3.

Generalist case management was the only model for which there is almost statistically significant evidence for an effect on personal functioning ($\hat{\delta} = .11$, $p = .06$). ACT, the most intensive model of case management, had an estimated effect of $\hat{\delta} = .04$, $p = .59$, strengths-based case management, $\hat{\delta} = 0.03$, $p = .67$, and brokerage, the least intensive model, $\hat{\delta} = 0.07$, $p = .31$. There were, however, no significant differences among the four models, $F(3, 12.4) = 0.73$, $p = .57$. Investigating the moderator effect of duration of follow-up, we found that the effect of case management was only significant at 12 months ($\hat{\delta} = 0.09$, $p = .01$), but effect estimates were similar for all follow-up periods, and there were no statistical differences among the seven follow-up periods, $F(6, 204) = 0.86$, $p = .52$. Moderators that did not have a significant effect are not reported here.

Case Management and Active Interventions

In total, five clinical trials contained 77 case management comparisons with active interventions. Case management was compared with motivational interviewing (Rapp et al., 2008), motivational interviewing with risk reduction (Corsi et al., 2007), vouchers to pay for treatment (Sorensen et al., 2005), and parenting classes for women (Dakof et al., 2010; Suchman et al., 2010). The studies contained five different outcome domains: health status and substance use functioning and linkage with substance abuse and ancillary services, and finally social inclusion. The active interventions were, on average, more effective than case management, although the effect was weak and nonsignificant ($\hat{\delta} = -.08$), $t(7.62) = -0.94$, $p = .38$. Average observed effect sizes for five clinical trials are presented in the lower section of Figure 2. Moderator analyses

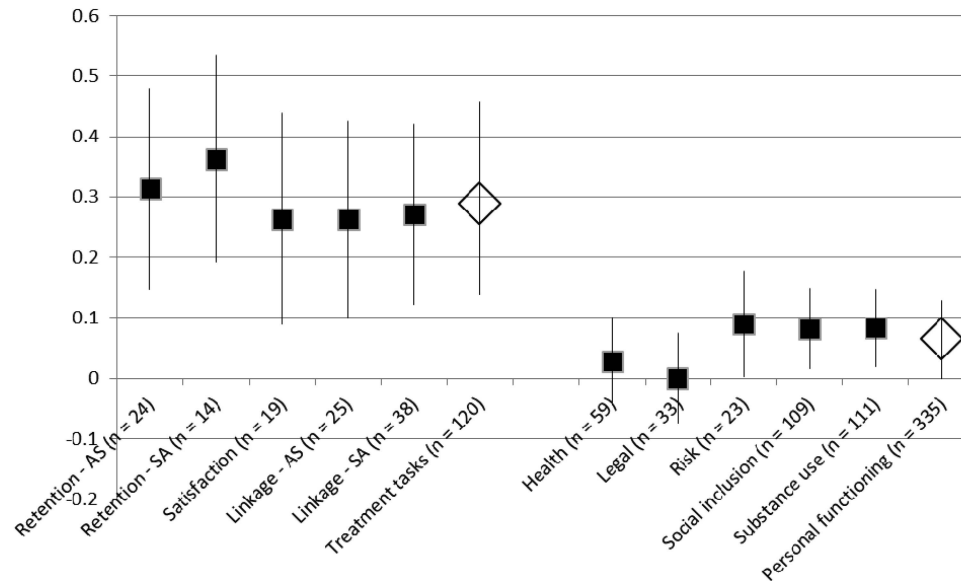


Figure 3. Forest plot of estimated effect sizes by individual (left) and combined (right) outcomes. AS = ancillary services; SA = substance abuse.

were not performed on active intervention comparisons, given the limited number of studies.

Checking model assumptions. Egger's intercept test (Egger et al., 1997) did not reveal evidence for reporting or publication bias, $t(15) = 1.20$, $p = .25$, for treatment tasks outcomes and, $t(11) = 0.17$, $p = .87$, for personal functioning. Correcting the estimated effects for publication bias using the Duval and Tweedie (2000) trim and fill method results in a decrease of the estimated effect from 0.37 to 0.31, with a 95% confidence interval between 0.11 and 0.51 for treatment-related outcomes, and no change for personal functioning. To check the assumption that the residuals are normally distributed, we made normal quantile plots (not shown in this article). There was no evidence for nonnormality in any of the analyses.

We performed sensitivity analyses, checking the impact of individual studies on the results by reanalyzing the data without moderators, each time leaving out one study. We found that the impact was small: For the treatment tasks, the estimated mean effect varied from 0.23 ($p = .001$; when leaving out Rapp et al., 1998) to .31 ($p = .001$; when leaving out the clinical trial of Rhodes & Gross, 1997). For personal functioning, the impact on the estimates was also small, but whether the mean effect was statistically significant depended on what study was left out: The estimated mean effect varies from 0.049 ($p = .11$; without the Morgenstern clinical trial) to 0.08 ($p = .03$; without the trial of Sorensen et al., 2003). For the comparison of case management with active interventions, effect size estimates ranged between -0.12 ($p = .26$; without the Corsi et al., 2007 trial) and 0.023 ($p = .19$; without the trial of Sorensen et al., 2005).

Discussion

In this study, we examined the effects of case management on outcomes associated with substance abuse treatment. In the current study, seven clinical trials and over 150 new outcomes were added

to a previous Cochrane Collaboration meta-analysis (Hesse et al., 2007). We also sought to identify in the current study whether or not case management had differential effects on treatment task and personal functioning outcomes. The three-level meta-analysis used in this study allowed us to investigate the consistency of case management's effect across these outcomes and to examine the effects of moderators (Van den Noortgate et al., 2012). Our findings inform the critical question of case management's appropriate role in substance abuse treatment and the direction of future research.

Case Management: Standard of Care and Active Interventions

The primary results from the earlier study (Hesse et al., 2007) were supported: Case management was more effective than standard-of-care conditions in improving outcomes. Although this finding suggests a positive role for case management, the presence of over 450 outcomes makes the result difficult to interpret because the outcomes are extremely diverse, including reducing HIV risk behavior, improving parenting skills, and facilitating linkage with treatment. Such broad expectations of a single intervention appear to be unfounded, as it is unlikely that any single psychosocial intervention can be expected to affect so many different outcomes. In some trials, the standard-of-care conditions included intensive services further obscuring the assessment of case management's effectiveness. The fact that case management had a significant effect on treatment task outcomes, even though some of the comparisons were relatively intensive, suggests that the reported effect size was conservative (i.e., it likely would have been larger if the comparison conditions had all been low intensity).

Although active interventions were more effective than case management, the effect was very weak and nonsignificant. The finding should be viewed with caution because only five clinical trials included a researcher-designated intervention, and the outcomes varied

widely, including vouchers for treatment, motivational interviewing, and two comprehensive parenting programs for women.

Case Management: Treatment Tasks and Personal Functioning Outcomes

Using a three-level approach, we identified a clinically important difference in how case management impacts treatment tasks compared with personal functioning outcomes. When treatment task and personal functioning outcomes were analyzed separately, we found case management's effect on the two groups was significantly different, moderate for treatment tasks, and minimal for personal functioning. Effect sizes for all five groups of treatment tasks—retention in ancillary and substance abuse services, treatment satisfaction, and linkage in ancillary and substance abuse services—were considerably larger than the highest personal functioning areas, risk behaviors and social inclusion. This finding is consistent with the results of meta-analyses of case management with mental health populations (Oldham, Kellett, Miles, & Sheeran, 2012; Ziguras & Stuart, 2000).

The finding that case management benefits treatment tasks was not surprising given the primary purpose of case management: to help individuals identify needed services, select the most appropriate services available in a given geographical area, facilitate linkage with services and promote continued retention in services by monitoring individuals' participation, coordinate the activities of multiple services when present and when necessary, and advocate for continued participation (National Association of Social Workers, 2012). Case management was equally effective in improving treatment task outcomes whether they involved substance abuse treatment or ancillary services. The implications of these findings are clear; if persons with substance abuse problems do not link with and remain in care, especially with substance abuse treatment, they cannot benefit from treatment interventions designed to improve functioning, no matter how effective the interventions themselves may be.

Our meta-analyses did not reveal an association between case management and personal functioning outcomes. Findings from previous studies suggest two alternative ways in which functioning may be impacted by case management. First, it is possible that case management has an indirect effect on personal functioning outcomes, through its effect on treatment tasks, if case management links individuals with and engages them in *effective* treatments. For example, persons with substance abuse problems who were leaving residential treatment and recently released parolees, both of whom were receiving case management, were retained in treatment longer than individuals not receiving case management. The longer retention was associated with a reduction in substance use at 6 months follow-up (Guydish et al., 2011; Rapp et al., 1998) and reduced criminal justice involvement at 12 months (Siegal et al., 2002). It appears that improved functioning was not a direct effect of case management, but a result of its ability to improve retention.

Second, by combining case management functions with specialized skills, personal functioning outcomes may be improved. An example of specialized training for case managers can be found in clinical case management where a single professional is trained to offer a regimen of therapeutic support and case management functions (Downey & Braude, 2005). In this instance, expecting case management to improve a personal functioning outcome such

as reduction in psychiatric symptoms may be appropriate. It may also be possible to combine case management functions with other interventions such as risk reduction activities. The expanded role of case management has been a frequent part of case management for persons with mental health and HIV/AIDS problems (Drake et al., 1998; Morse et al., 2006).

Moderator effects on treatment tasks. We expected that ACT would have a substantially stronger effect on treatment task outcomes than other models, particularly brokerage case management. We also expected that generalist case management would provide an effect that was stronger than brokerage, but less than strengths-based case management. These predictions were based on the fact that brokerage case management usually consists of brief referral with little or no follow-up, whereas ACT services are provided as part of a highly integrated team who can address client needs intensively and by referral to outside sources (Rosen, Mueser, & Teesson, 2007; Ziguras & Stuart, 2000). We also anticipated that the emphasis on strengths and assets of strengths-based case management would provide a value-added benefit over and above the basic functions of generalist case management. Although all results were in the expected direction, the differences among models' effect sizes were not significantly different. The finding that ACT was not substantially more effective than brokerage case management may have been population-related; two of the three ACT trials consisted of dually diagnosed individuals, ostensibly a group with greater impairment. This issue needs to be examined further, given the much higher costs involved in implementing ACT (Jerrell & Hu, 1996). Although these results may accurately reflect the similarity of the four models in improving treatment task outcomes, there are also limitations in the trials that we reviewed that could have affected results. There were only two studies of brokerage case management and five of ACT available for analysis, and the relatively small number of participants in these studies may have affected results. Second, the frequently vague or absent descriptions of case management accompanying the studies may have resulted in our inaccurately categorizing the models in some studies.

A second moderator finding showed that case management improved treatment task outcomes for persons in treatment when case management began, as well as those who were out of treatment. The benefit of case management to persons who were out of treatment was in facilitating linkage with treatment and was demonstrated in several settings (Morgenstern et al., 2006; Rapp et al., 2008; Scott et al., 2002; Sorensen et al., 2005). Case management's primary benefit to in-treatment populations was to improve retention (Siegal et al., 2002). The importance of both linkage and retention cannot be overstated, given the consistent association between retention and treatment success (Vanderplasschen et al., 2013).

Neither of the study features used as moderators—length of study follow-up or methodological quality—demonstrated significant effects on the effectiveness of case management.

Limitations of the Review

This meta-analytic review has limitations that are often cited as endemic to all meta-analyses (Lipsey & Wilson, 2001; Sharpe, 1997). First, all studies selected for inclusion in the meta-analysis were randomized trials. Quasi-experimental trials may be another source for case management studies. Even though the trials in this

study were all randomized, they still differed methodologically. As an example, studies used numerous different instruments to measure personal functioning outcomes, at least 10 to measure substance use. Also, the trials in this analysis contained at least seven fairly distinct populations, including persons with both substance abuse and mental health problems, women probationers, injectable drug users with and without HIV, and homeless men, among others. It is likely that members of these groups have different treatment needs, which may also affect goals and objectives addressed by case managers.

Another limitation of the meta-analysis was the result of the total absence of fidelity measures to assess the clinical quality of the case management that was delivered in a trial. A lack of fidelity measures kept us from determining whether or not a model's implementation was robust or marginal and then controlling for that difference through moderator analyses.

Even though we used characteristics of case management as moderators to help explain its efficacy, it is difficult to quantify all of the influences that might influence outcomes. Case management is frequently described as being contextual and reflective of the setting in which it is located (Rapp et al., 2008; Vanderplasschen et al., 2004), suggesting that the availability of community services may influence the overall success of case management and the specific model that is optimal in a given situation. Even when resources are available, the quality of care is likely beyond the control of case managers.

Conclusions

Case management used in the treatment of substance use disorders was moderately effective in improving linkage and retention with substance abuse treatment and important ancillary services. This finding alone suggests that the functions of case management should be fully integrated into the substance abuse continuum of care and into new treatment interventions. Future studies that clarify case management's mechanism of action in enhancing treatment tasks will be important. If case management is expected to improve personal functioning outcomes, selected behavior change strategies should be blended with traditional case management functions.

References

- Barnett, P. G., Masson, C. L., Sorensen, J. L., Wong, W., & Hall, S. (2006). Linking opioid-dependent hospital patients to drug treatment: Health care use and costs 6 months after randomization. *Addiction, 101*, 1797–1804. doi:10.1111/j.1360-0443.2006.01636.x
- Becker, B. J. (2000). Multivariate meta-analysis. In H. E. A. Tinsley & E. D. Brown (Eds.), *Handbook of applied multivariate statistics and mathematical modeling* (pp. 499–525). Orlando, FL: Academic Press. doi:10.1016/B978-012691360-6/50018-5
- Bond, G. R., Drake, R. E., McHugo, G. J., Rapp, C. A., & Whitley, R. (2009). Strategies for improving fidelity in the National Evidence-Based Practices Project. *Research on Social Work Practice, 19*, 569–581. doi:10.1177/1049731509335531
- Borenstein, M., Hedges, L. V., Higgins, J. P. T., & Rothstein, H. (2005). *Comprehensive meta-analysis* (version 2). Englewood, NJ: Biostat.
- Braucht, G. N., Reichardt, C. S., Geissler, L. J., Bormann, C. A., Kwiatkowski, C. F., & Kirby, M. W. (1995). Effective services for homeless substance abusers. *Journal of Addictive Diseases, 14*(4), 87–109.
- Brun, C., & Rapp, R. C. (2001). Strengths-based case management: Individuals' perspectives on strengths and the case manager relationship. *Social Work, 46*, 278–288. doi:10.1093/sw/46.3.278
- Calsyn, R. J., Yonker, R. D., Lemming, M. R., Morse, G. A., & Klinkenberg, W. D. (2005). Impact of assertive community treatment and client characteristics on criminal justice outcomes in dual disorder homeless individuals. *Criminal Behaviour and Mental Health, 15*, 236–248. doi:10.1002/cbm.24
- Carr, C. J., Xu, J. M., Redko, C., Lane, D. T., Rapp, R. C., Goris, J., & Carlson, R. G. (2008). Individual and system influences on waiting time for substance abuse treatment. *Journal of Substance Abuse Treatment, 34*, 192–201. doi:10.1016/j.jsat.2007.03.005
- Carroll, K. M., & Schottenfeld, R. (1997). Nonpharmacologic approaches to substance abuse treatment. *Medical Clinics of North America, 81*, 927–944. doi:10.1016/S0025-7125(05)70556-3
- Center for Substance Abuse Treatment. (1998). *Comprehensive case management for substance abuse treatment: Treatment Improvement Protocol (TIP) Series, No. 27* (Report No. [SMA] 98-3222). Rockville, MD: Substance Abuse and Mental Health Services Administration.
- Cohen, J. (1992). A power primer. *Psychological Bulletin, 113*, 155–159.
- Conrad, K. J., Hultman, C. I., Pope, A. R., Lyons, J. S., Baxter, W. C., Daghestani, A. N., . . . Manheim, L. M. (1998). Case managed residential care for homeless addicted veterans: Results of a true experiment. *Medical Care, 36*, 40–53. doi:10.1097/00005650-199801000-00006
- Corsi, K. F., Kwiatkowski, C. F., & Booth, R. E. (2007). Treatment entry and predictors among opiate-using injection drug users. *The American Journal of Drug and Alcohol Abuse, 33*, 121–127. doi:10.1080/00952990601091093
- Coviello, D. M., Zanis, D. A., Wesnoski, S. A., & Alterman, A. I. (2006). The effectiveness of outreach case management in re-enrolling discharged methadone patients. *Drug and Alcohol Dependence, 85*, 56–65. doi:10.1016/j.drugalcdep.2006.03.009
- Cox, G. B., Walker, R. D., Freng, S. A., Short, B. A., Meijer, L., & Gilchrist, L. (1998). Outcome of a controlled trial of the effectiveness of intensive case management for chronic public inebriates. *Journal of Studies on Alcohol, 59*, 523–532.
- Dakof, G. A., Cohen, J. B., Henderson, C. E., Duarte, E., Boustani, M., Blackburn, A., . . . Hawes, S. (2010). A randomized pilot study of the Engaging Moms Program for family drug court. *Journal of Substance Abuse Treatment, 38*, 263–274. doi:10.1016/j.jsat.2010.01.002
- Dauber, S., Neighbors, C., Dasaro, C., Riordan, A., & Morgenstern, J. (2012). Impact of intensive case management on child welfare system involvement for substance-dependent parenting women on public assistance. *Children and Youth Services Review, 34*, 1359–1366. doi:10.1016/j.childyouth.2012.03.020
- de Vet, R., Beijersbergen, M. D., van Luitelaar, M. J. A., Brilleslijper-Kater, S. N., Vanderplasschen, W., & Wolf, J. (2013). Effectiveness of case management for homeless persons: A systematic review. *American Journal of Public Health, 103*, e13–e26. doi:10.2105/AJPH.2013.301491
- Downey, K. J., & Braude, L. (2005). The case management role in clinical reentry management. *Offender Substance Abuse Report, 5*(3), 33–35.
- Drake, R. E., McHugo, G. J., Clark, R. E., Teague, G. B., Xie, H. Y., Miles, K., & Ackerson, T. H. (1998). Assertive community treatment for patients with co-occurring severe mental illness and substance use disorder: A clinical trial. *American Journal of Orthopsychiatry, 68*, 201–215. doi:10.1037/h0080330
- Duval, S., & Tweedie, R. (2000). A nonparametric “trim and fill” method of accounting for publication bias in meta-analysis. *Journal of the American Statistical Association, 95*, 89–98.
- Egger, M., Smith, G., Schneider, M., & Minder, C. (1997). Bias in meta-analysis detected by a simple, graphical test. *British Medical Journal, 315*, 629–634. doi:10.1136/bmj.315.7109.629

- Essock, S. M., Mueser, K. T., Drake, R. E., Covell, N. H., McHugo, G. J., Frisman, L. K., . . . Swain, K. (2006). Comparison of ACT and standard case management for delivering integrated treatment for co-occurring disorders. *Psychiatric Services, 57*, 185–196. doi:10.1176/appi.ps.57.2.185
- Falck, R., Carlson, R. G., Price, S. K., & Turner, J. A. (1994). Case management to enhance HIV risk reduction among users of injection drugs and crack cocaine. *Journal of Case Management, 3*, 162–166.
- Guydish, J., Chan, M., Bostrom, A., Jessup, M., Davis, T., & Marsh, C. (2011). A randomized trial of probation case management for drug-involved women offenders. *Crime & Delinquency, 57*, 167–198. doi:10.1177/0011128708318944
- Halfon, N., Berkowitz, G., & Klee, L. (1993). Development of an integrated case management program for vulnerable children. *Child Welfare, 72*, 379–396.
- Hall, J. A., Sarrazin, M. S. V., Huber, D. L., Vaughn, T., Block, R. I., Reedy, A. R., & Jang, M. J. (2009). Iowa case management for rural drug abuse. *Research on Social Work Practice, 19*, 407–422. doi:10.1177/1049731509331925
- Hedges, L. V. (1981). Distribution theory for Glass's estimator of effect size and related estimators. *Journal of Educational Statistics, 6*, 107–128. doi:10.2307/1164588
- Heinemann, A. W., Corrigan, J. D., & Moore, D. (2004). Case management for traumatic brain injury survivors with alcohol problems. *Rehabilitation Psychology, 49*, 156–166. doi:10.1037/0090-5550.49.2.156
- Hesse, M., Vanderplasschen, W., Rapp, R. C., Broekaert, E., & Fridell, M. (2007). Case management for persons with substance use disorders. *Cochrane Database of Systematic Reviews, 4*, CD006265. doi:10.1002/14651858.CD006265.pub3
- Jansson, L. M., Svikis, D. S., Breon, D., & Cieslak, R. (2005). Intensity of case management services: Does more equal better for drug-dependent women and their children. *Social Work in Mental Health, 3*, 63–78. doi:10.1300/J200v03n04_04
- Jerrell, J., & Hu, T. (1996). Estimating the cost impact of three dual diagnosis treatment programs. *Evaluation Review, 20*, 160–180. doi:10.1177/0193841X9602000203
- Jerrell, J. M., & Ridgely, S. (1995). Comparative effectiveness of three approaches to serving people with severe mental illness and substance abuse disorders. *Journal of Nervous and Mental Disease, 183*, 566–576. doi:10.1097/00005053-199509000-00002
- Karow, A., Reimer, J., Schafer, I., Krausz, M., Haasen, C., & Verthein, U. (2010). Quality of life under maintenance treatment with heroin versus methadone in patients with opioid dependence. *Drug and Alcohol Dependence, 112*, 209–215. doi:10.1016/j.drugalcdep.2010.06.009
- Lipsey, M. W., & Wilson, D. B. (2001). *Practical meta-analysis*. Thousand Oaks, CA: Sage.
- Littell, R. C., Milliken, G. A., Stroup, W. W., Wolfinger, R. D., & Schabenberger, O. (2006). *SAS system for mixed models* (2nd ed.). Cary, NC: SAS Institute.
- Manuel, J. I., Covell, N. H., Jackson, C. T., & Essock, S. M. (2011). Does assertive community treatment increase medication adherence for people with co-occurring psychotic and substance use disorders? *Journal of the American Psychiatric Nurses Association, 17*, 51–56. doi:10.1177/1078390310395586
- Marsden, J., Gossop, M., Stewart, D., Best, D., Farrell, M., Lehmann, P., . . . Strang, J. (1998). The Maudsley Addiction Profile (MAP): A brief instrument for assessing treatment outcome. *Addiction, 93*, 1857–1867. doi:10.1046/j.1360-0443.1998.9312185711.x
- Martin, S. S., & Scarpitti, F. R. (1993). An intensive case-management approach for paroled IV drug-users. *Journal of Drug Issues, 23*, 43–59.
- McLellan, A. T., Hagan, T. A., Levine, M., Meyers, K., Gould, F., Bencivengo, M., . . . Jaffe, J. (1999). Does clinical case management improve outpatient addiction treatment? *Drug and Alcohol Dependence, 55*, 91–103. doi:10.1016/S0376-8716(98)00183-5
- McLellan, A. T., Kushner, H., Metzger, D., Peters, R., Smith, I., Grissom, G., . . . Argeriou, M. (1992). The fifth edition of the Addiction Severity Index. *Journal of Substance Abuse Treatment, 9*, 199–213. doi:10.1016/0740-5472(92)90062-s
- Mejta, C. L., Bokus, P. J., Mickenberg, J., Maslar, M. E., & Senay, E. (1997). Improving substance abuse treatment access and retention using a case management approach. *Journal of Drug Issues, 27*, 329–340.
- Miller, W. R., & Wilbourne, P. L. (2002). Mesa Grande: A methodological analysis of clinical trials of treatments for alcohol use disorders. *Addiction, 97*, 265–277. doi:10.1046/j.1360-0443.2002.00019.x
- Moher, L. A., Tetzlaff, J., & Altman, D. G. (2009). Preferred reporting items for systematic reviews and meta-analyses: *The PRISMA Statement PLoS Med, 6*, e1000097. doi:10.1371/journal.pmed.1000097
- Morgenstern, J., Blanchard, K. A., McCrady, B. S., McVeigh, K. H., Morgan, T. J., & Pandina, R. J. (2006). Effectiveness of intensive case management for substance-dependent women receiving temporary assistance for needy families. *American Journal of Public Health, 96*, 2016–2023. doi:10.2105/AJPH.2005.076380
- Morgenstern, J., Hogue, A., Dauber, S., Dasaro, C., & McKay, J. R. (2009). Does coordinated care management improve employment for substance-using welfare recipients? *Journal of Studies on Alcohol and Drugs, 70*, 955–963.
- Morgenstern, J., Neighbors, C. J., Kuerbis, A., Riordan, A., Blanchard, K. A., McVeigh, K. H., & McCrady, B. (2009). Improving 24-month abstinence and employment outcomes for substance-dependent women receiving temporary assistance for needy families with intensive case management. *American Journal of Public Health, 99*, 328–333. doi:10.2105/ajph.2007.133553
- Morse, G. A., Calsyn, R. J., Klinkenberg, W. D., Helminiak, T. W., Wolff, N., Drake, R. E., . . . McCudden, S. (2006). Treating homeless clients with severe mental illness and substance use disorders: Costs and outcomes. *Community Mental Health Journal, 42*, 377–404. doi:10.1007/s10597-006-9050-y
- National Association of Social Workers. (2012). *NASW standards for social work case management*. Washington, DC: Author.
- National Institute on Drug Abuse. (1999). *Principles of drug addiction treatment: A research-based guide*. Retrieved from <http://www.drugabuse.gov/PODAT/PODATIndex.html>
- National Institutes of Health. (2013). *Glossary of terms for human subjects protection and inclusion issues*. Retrieved from http://grants.nih.gov/grants/peer/tree_glossary.pdf
- Oldham, M., Kellett, S., Miles, E., & Sheeran, P. (2012). Interventions to increase attendance at psychotherapy: A meta-analysis of randomized controlled trials. *Journal of Consulting and Clinical Psychology, 80*, 928–939. doi:10.1037/a0029630
- Prendergast, M., Frisman, L., Sacks, J. Y., Staton-Tindall, M., Greenwell, L., Lin, H. J., & Cartier, J. (2011). A multi-site, randomized study of strengths-based case management with substance-abusing parolees. *Journal of Experimental Criminology, 7*, 225–253. doi:10.1007/s11292-011-9123-y
- Rapp, R. C. (2006). Strengths-based case management: Enhancing treatment for persons with substance abuse problems. In D. Saleebey (Ed.), *The strengths perspective in social work practice* (4th ed., pp. 128–147). Boston, MA: Pearson, Allyn-Bacon.
- Rapp, R. C., Otto, A. L., Lane, D. T., Redko, C., McGatha, S., & Carlson, R. G. (2008). Improving linkage with substance abuse treatment using brief case management and motivational interviewing. *Drug and Alcohol Dependence, 94*, 172–182. doi:10.1016/j.drugalcdep.2007.11.012
- Rapp, R. C., Siegal, H. A., Li, L., & Saha, P. (1998). Predicting post-primary treatment services and drug use outcome: A multivariate analysis. *American Journal of Drug and Alcohol Abuse, 24*, 603–615. doi:10.3109/00952999809019610

- Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods* (2nd ed.). London, England: Sage.
- Rhodes, W., & Gross, M. (1997). *Case management reduces drug use and criminality among drug-involved arrestees: An experimental study of an HIV prevention intervention*. Washington, DC: U.S. Department of Justice, Office of Justice Programs, National Institute of Justice.
- Rosen, A., Mueser, K. T., & Teesson, M. (2007). Assertive community treatment—Issues from scientific and clinical literature with implications for practice. *Journal of Rehabilitation Research & Development, 44*, 813–825. doi:10.1682/JRRD.2006.09.0110
- Rosenheck, R. A., Neale, M. S., & Mohamed, S. (2010). Transition to low intensity case management in a VA Assertive Community Treatment model program. *Psychiatric Rehabilitation Journal, 33*, 288–296. doi:10.2975/33.4.2010.288.296
- Saleh, S. S., Vaughn, T., Hall, J. A., Levey, S., Fuortes, L., & Uden-Holmen, T. (2002). *Effectiveness of case management in substance abuse treatment*. Unpublished manuscript.
- Saleh, S. S., Vaughn, T., Hall, J. A., Levey, S., Fuortes, L., & Uden-Holmen, T. (2003). The effect of case management in substance abuse on health services use. *Care Management Journals, 4*, 82–87.
- Saleh, S. S., Vaughn, T., Levey, S., Fuortes, L., Uden-Holmen, T., & Hall, J. A. (2006). Cost-effectiveness of case management in substance abuse treatment. *Research on Social Work Practice, 16*(38), 38–47.
- Satterthwaite, F. E. (1946). An approximate distribution of estimates of variance components. *Biometrics Bulletin, 2*, 110–114. doi:10.2307/3002019
- Scott, C. K., Sherman, R. E., Foss, M. A., Godley, M., & Hristova, L. (2002). Impact of centralized intake on case management services. *Journal of Psychoactive Drugs, 34*, 51–57. doi:10.1080/02791072.2002.10399936
- Sharpe, D. (1997). Of apples and oranges, file drawers and garbage: Why validity issues in meta-analysis will not go away. *Clinical Psychology Review, 17*, 881–901. doi:10.1016/S0272-7358(97)00056-1
- Siegal, H. A., Fisher, J. H., Rapp, R. C., & Kelliher, C. W. (1996). Enhancing substance abuse treatment with case management: Its impact on employment. *Journal of Substance Abuse Treatment, 13*, 93–98. doi:10.1016/0740-5472(96)00029-3
- Siegal, H. A., Li, L., & Rapp, R. C. (2002). Case management as a therapeutic enhancement: Impact on post-treatment criminality. *Journal of Addictive Diseases, 21*, 37–46. doi:10.1300/J069v21n04_04
- Siegal, H. A., Rapp, R. C., Kelliher, C. W., Fisher, J. H., Wagner, J. H., & Cole, P. A. (1995). The strengths perspective of case management: A promising inpatient substance abuse treatment enhancement. *Journal of Psychoactive Drugs, 27*, 67–72. doi:10.1080/02791072.1995.10471674
- Siegal, H. A., Rapp, R. C., Li, L., Saha, P., & Kirk, K. D. (1997). The role of case management in retaining clients in substance abuse treatment: An exploratory analysis. *Journal of Drug Issues, 27*, 821–831.
- Sorensen, J. L., Dille, J., London, J., Okin, R. L., Delucchi, K. L., & Phibbs, G. S. (2003). Case management for substance abusers with HIV/AIDS: A randomized clinical trial. *American Journal of Drug and Alcohol Abuse, 29*, 133–150. doi:10.1081/ADA-120018843
- Sorensen, J. L., Masson, C. L., Delucchi, K., Sporer, K., Barnett, P., Mitsuishi, F., . . . Hall, S. M. (2005). Randomized trial of drug abuse treatment-linkage strategies. *Journal of Consulting and Clinical Psychology, 73*, 1026–1035. doi:10.1037/0022-006X.73.6.1026
- Stahler, G. J., Shipley, T. F., Bartelt, D., DuCette, J. P., & Shandler, I. W. (1996). Evaluating alternative treatments for homeless substance-abusing men: Outcomes and predictors of success. *Journal of Addictive Diseases, 14*, 151–167. doi:10.1300/J069v14n04_09
- Stein, L. I., & Test, M. A. (1980). Alternative to mental hospital treatment: Conceptual model, treatment program and clinical evaluation. *Archives of General Psychiatry, 37*, 392–397. doi:10.1001/archpsyc.1980.01780170034003
- Suchman, N. E., DeCoste, C., Castiglioni, N., McMahon, T. J., Rounsaville, B., & Mayes, L. (2010). The Mothers and Toddlers Program, an attachment-based parenting intervention for substance using women: Post-treatment results from a randomized clinical pilot. *Attachment and Human Development, 12*, 483–504. doi:10.1080/14616734.2010.501983
- Van den Bussche, E., Van den Noortgate, W., & Reynvoet, B. (2009). Mechanisms of masked priming: A meta-analysis. *Psychological Bulletin, 135*, 452–477. doi:10.1037/a0015329
- Van den Noortgate, W., López-López, J. A., Marín-Martínez, F., & Sanchez-Meca, J. (2012). Three level meta-analyses of dependent effect sizes. *Behavior Research Methods, 45*, 576–594. doi:10.3758/s13428-012-0261-6
- Vanderplasschen, W., Colpaert, K., Atrique, M., Rapp, R. C., Pearce, S., Broekaert, E., & Vandeveld, S. (2013). Therapeutic communities for addictions: A review of their effectiveness from a recovery-oriented perspective. *The Scientific World Journal, 2013*, 427817. doi:10.1155/2013/427817
- Vanderplasschen, W., Rapp, R. C., Wolf, J. R., & Broekaert, E. (2004). The development and implementation of case management for substance use disorders in North America and Europe. *Psychiatric Services, 55*, 913–922. doi:10.1176/appi.ps.55.8.913
- Vanderplasschen, W., Wolf, J., Rapp, R. C., & Broekaert, E. (2007). Effectiveness of different models of case management for substance-abusing populations. *Journal of Psychoactive Drugs, 39*, 81–95. doi:10.1080/02791072.2007.10399867
- Vaughan Sarrazin, M. S., & Hall, J. A. (2004). Impact of Iowa case management on provisions of social support for substance abuse clients. *Care Management Journals, 5*(1), 3–114.
- Vaughan Sarrazin, M. S., Hall, J. A., & Rick, G. S. (2000). Impact of case management on use of health services by rural clients in substance abuse treatment. *Journal of Drug Issues, 30*, 435–463.
- Vaughan Sarrazin, M., Huber, D. L., & Hall, J. A. (2001). Impact of Iowa case management on family functioning for substance abuse treatment clients. *Adolescent & Family Health, 2*(3), 132–140.
- Vevea, J. L., & Woods, C. M. (2005). Publication bias in research synthesis: Sensitivity analysis using a priori weight functions. *Psychological Methods, 10*, 428–443. doi:10.1037/1082-989X.10.4.428
- Zanis, D. A., McLellan, A. T., Alterman, A. I., & Cnaan, R. A. (1996). Efficacy of enhanced outreach counseling to reenroll high-risk drug users 1 year after discharge from treatment. *American Journal of Psychiatry, 153*, 1095–1096.
- Ziguras, S. J., & Stuart, G. W. (2000). A meta-analysis of the effectiveness of mental health case management over 20 years. *Psychiatric Services, 51*, 1410–1421. doi:10.1176/appi.ps.51.11.1410

Received August 7, 2012

Revision received February 19, 2014

Accepted March 19, 2014 ■