Case Management for persons with substance use disorders

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ABSTRACT

Background
Patients with alcohol and other drug use disorders (AOD) frequently have multiple social, physical, and mental health treatment needs, yet have difficulty accessing community services, including drug abuse treatment. One strategy for linking patients with AOD with relevant services is case management, where a single case manager is responsible for linking patients with multiple relevant services.

Objectives
To conduct a systematic review of all RCTs on the use of case management for helping drug abusers in or out of treatment. Outcome criteria included successful linkage with other services, illicit drug use outcomes, and a range of related outcomes.

Search strategy
We searched the Cochrane Controlled Trials Register (Cochrane Library, issue 4, 2006), MEDLINE (1966 - 2006), EMBASE (1980 - 2006), LILACS (1982 - 2006), PsycINFO (1973 - 2006), Biological Abstracts (1982 t- 2000). Reference searching; personal communication; conference abstracts; book chapters on case management.

Selection criteria
Randomized controlled studies that compared a specific model of case management with either treatment as usual or another treatment model, included only patients with at least one alcohol or drug related problem.

Data collection and analysis
Two groups of reviewers extracted the data independently . Standardized mean difference was estimated.

Main results
In total, we could extract results from 15 studies. Outcome on illicit drug use was reported from 7 studies with 2391 patients. The effect size for illicit drug use was not significant, and small (standardized mean difference (SMD)=0.12, confidence interval=-0.09,0.29, p=0.20). Substantial heterogeneity was found (I^2=69.9%). Linkage to other treatment services was reported in 10 studies with 3132 patients. The effect size for linkage was moderate (SMD=0.42, 95% confidence interval=0.21 to 0.62, p<0.001), but substantial heterogeneity was found (I^2=85.2%). Moderator analyses suggested that a part of the heterogeneity found in linkage studies could be explained by the presence or absence of a treatment manual for case management. A single, large trial of case management with two arms, showed that case management was superior to psychoeducation and drug counselling in reducing drug use.

Authors' conclusions
There is current evidence supporting that case management can enhance linkage with other services. However, evidence that case management reduces drug use or produce other beneficial outcome is not conclusive.

PLAIN LANGUAGE SUMMARY

Illicit use of drugs such as opioids, cocaine, amphetamines, cannabis and alcohol dependence have health, social and economic complications. Users often have long-term problems in addition to substance abuse. Case
management is a client-centred strategy involving assessment, planning, linking to relevant services and community resources and advocacy. Its intent is to improve the co-ordination and continuity of delivery of services. Brokerage case management sets out to help clients identify their needs and broker services in one or two contacts; intensive case management involves a closer interaction between case manager and client; assertive community treatment (provides assertive outreach and direct counselling services; strengths-based case management focuses on self-direction and the use of informal networks rather than agency resources by applying active outreach. From this review, case management effectively linked people with substance abuse to community and treatment services as compared to treatment as usual or other viable treatment options, such as psycho-education or brief
interventions. This conclusion is based on 10 randomized controlled trials involving 3132 participants that compared case management to usual treatment. Two studies compared case management with other specific
treatments. Additional analysis of the studies suggested that the use of a manual to guide the delivery of case management could increase linkage. A total of 15 controlled studies that randomized a total of 6694 participants were included in the review. One study was conducted in Europe; all other studies were from North America.
Seven studies with 2391 participants did not find a clear reduction in illicit drug use with case management compared with usual treatment; similarly with alcohol use (two studies). A single, large trial showed that case management for heroin users was superior to psycho-education and drug counselling in reducing drug use. The extent of linkage varied significantly between studies, which is likely to be influenced by the availability of services in the community, the model of case management, how effectively it is applied and its integration in the local network of services.

BACKGROUND

According to the World Health Organization, the prevalence of current alcohol dependence in the European Union is estimated to be between 3.8 (Germany) and 12.2% (Poland) of the adult population, while these percentages are around 7.7 and 9.3% in the United States and Canada respectively (WHO 2004). Concerning illicit drug use, the most recent figures indicate that the prevalence of opiate abuse among persons from 15 to 64 years old is around 0.5% in most Western countries (EU, US, Canada and Australia) (UNODC 2005). The prevalence of cocaine abuse is estimated around 1% in the European Union and Australia, but over 2% in Canada and around 3% in the US. The prevalence of amphetamine abuse is generally lower than 1%, but cannabis abuse rates over 10% in several European countries, Canada, the US and Australia (UNODC 2005).
Substance use disorders [SUD] are associated with a wide range of serious health, social and economic complications. The health status of alcohol and drug abusers is generally affected by their substance abuse (de Alba 2004). Consequently, their life expectancy is often much lower than among the general population (Price 2001; Sørensen 2005; Wahren 1997). People with alcohol or drug abuse are less likely to be working (Ettner 1997) and alcohol addiction is associated with prematurely leaving the workforce (Romelsjo 2004). Housing, relational and judicial problems are also well documented among substance abusers. Drug and alcohol abuse further cause high costs due to frequent and multiple hospitalisations and treatment episodes (Xie 1998a; Xie 1998b).
Despite the multi-faceted and complex nature of substance abuse problems, few treatment programs are equipped to provide the expanded array of services necessary to meet clients' diverse needs (Brindis 1997). Moreover, since substance abuse is increasingly recognised as a chronic and relapsing disorder (McLellan 2002), ongoing support services and continuing care are necessary to assist clients in stabilizing and overcoming their problems.
The observation that many substance abusers have significant long-lasting problems in addition to abusing substances has been the main impetus for using case management as an enhancement and supplement to traditional substance abuse treatment services (Vanderplasschen 2004). Case management has a long and relatively successful history for the treatment and support of various mental health populations in the United States, Australia, Canada and several European countries (Burns 2001). From the mid-1980's on, this intervention was adapted to work with persons with substance use disorders and has been applied among specific populations, such as dually diagnosed persons, homeless individuals and substance abusing mothers.
Case management is a client-centred strategy to improve the co-ordination and continuity of the delivery of services, especially for persons with multiple and complex needs. One of the first definitions has described this intervention as "that part of substance abuse treatment that provides ongoing supportive care to clients and facilitates linking with appropriate helping resources in the community" (Graham 1989). Case management is usually characterized by its basic functions: assessment, planning, linking, monitoring and advocacy (SAMHSA 1998).
Despite the lack of a common definition and divergent practices from place to place, following models of case management are usu-

ally distinguished for working with substance abusers: (1) brokerage case management; (2) generalist/intensive case management; (3) assertive community treatment; (4) clinical case management; (5) strengths-based case management (Vanderplasschen 2004).
The brokerage model is a very brief approach to case management in which case workers attempt to help clients identify their needs and broker ancillary or supportive services, all in one or two contacts. Generalist or standard models utilize the commonly accepted functions of case management (assessment, planning, linking, monitoring, advocacy) and are characterized by a closer involvement between case manager and client. Similarly, intensive case management applies the same principles, usually with a smaller caseload and greater intensity of service provision. Assertive Community Treatment (ACT) consists of a 'wrap-around set of services' and assumes a comprehensive role for a team of case managers by providing assertive outreach and direct counselling services, including skills-building, family consultations and crisis intervention. The clinical approach combines resources acquisition (case management) and clinical activities, which might include psychotherapy for clients and their families (Coldwell 2007). Finally, strengths-based case management focuses on clients' strengths, self-direction, and the use of informal help networks (as opposed to agency resources). It further stresses the primacy of the client-case manager relationship and applies an active form of outreach. As opposed to case management for persons with (severe) mental illness (Coldwell 2007; Zwarenstein 2000; Ziguras 2000), no meta-analysis has yet been published on the effectiveness of this intervention for persons with substance use disorders (Vanderplasschen 2007 in press). The aim of this review is to examine the evidence for the effectiveness of case management for persons with substance use disorders and to identify which aspects of this intervention influence its effectiveness. Social, health and economic outcome measures will be included.

OBJECTIVES

(1) To assess whether case management reduces substance use and improves quality of life compared with other forms of treatment, including 'treatment as usual', standard community treatment, other (non-case management) psychosocial interventions or waitlist controls;
(2) To evaluate whether case management links patients with the services they need and whether this linkage is related to the effects of case management;
(3) To study whether other potential mediating variables (e.g. model of case management, type of population served, methodological characterstics of studies) affect case management-outcomes.

CRITERIA FOR CONSIDERING STUDIES FOR THIS REVIEW

Types of studies

Randomized controlled trials that compare a specific case management model with 'treatment as usual' or other non-case management forms of treatment.

Types of participants

Persons with substance use disorders (abuse or dependence of any substance). Studies including people with other mental disorders are eligible, if substance use disorders are present in the entire sample.

Types of intervention

Experimental intervention
Any model of case management (brokerage model, generalist/intensive case management, assertive community treatment, clinical case management, or strengths-based case management)
Control
'Treatment as usual', standard community treatment, other psychosocial interventions or waitlist controls

Types of outcome measures

Primary Outcomes
Since case management is a comprehensive intervention with multiple aims, primary outcomes were defined as the 7 problem areas covered by the Addiction Severity Index (ASI) (MCLellan 1985), plus living situation. For each of the problem areas, some possible outcome measures are described below. Outcomes must not necessarily be measured by the ASI:
(1) Drug use (e.g., self-report, biological markers, problem severity measured by ASI, Drug Abuse Screening Test (DAST) or a similar scale)
(2) Alcohol use (e.g., self-report, biological markers, problem severity measured by ASI, Alcohol Used Disorder Identification Test (AUDIT) or a similar scale
(3) Employment and income (e.g., number of days working, income from work, daily activities, problem severity measured by ASI)
(4) Physical health (e.g., number of days hospitalised for physical problems, SF-36 Health Questionnaire, problem severity measured by ASI)
(5) Legal status (e.g., number of days incarcerated, proportion of subjects charged for a (drug-related) offence, problem severity measured by ASI)
(6) Family/social relations (e.g., extent of the social network, burden for the family, problem severity measured by ASI)
(7) Mental health (e.g., Hamilton rating scale for depression, Beck depression inventory, Symptom Check List-90, psychiatric problem severity measured by ASI)
(8) Living situation (e.g., number of days in own house, number of days in sheltered/protected living facility, housing stability)

In case an outcome measure is reported, a single effect size will be computed for each area for each study, by averaging the effect sizes for each indicator.
In case one or more outcome measures were reported, we computed a single effect size for each study by averaging the effect sizes for each problem area.

Secondary outcomes
While primary outcomes can be mainly situated at the level of the individual, secondary outcomes rather relate to structural achievements:
(9) Treatment participation and retention (only reported in trials that compared to active treatments)
(10) Service utilization, not including case management services. This is defined as 'successful linkage', i.e., getting patients to receive services they need
(11) Rehospitalisation, including emergency room utilisation
(12) Satisfaction with the intervention received

SEARCH METHODS FOR IDENTIFICATION OF STUDIES

See: methods used in reviews.

Both electronic and manual searches were undertaken to identify studies for this review.
Electronic searches:
Relevant studies that meet the predefined inclusion criteria were identified by searching the following sources from the earliest available date to 2006:
1) The Cochrane Central Register of Controlled Trials (CENTRAL- The Cochrane Library, most recent) which include the Cochrane Drugs and Alcohol Groups specialised register
2) MEDLINE (from 1966 - to present)
3) EMBASE (from 1988 - to present)
4) CINAHL (1982- to present)
5) LILACS (update August 2006)
6) Toxibase (www.toxibase.org) until September 2004.
Search strategy is shown in additional table 2.
There were no language or publication year restrictions.

In addition, the reference lists of retrieved studies, reviews, conference abstracts and grey literature were scanned for other relevant (un)published studies. A search of the registry of ongoing clinical trials was done for identifying ongoing studies, with no language restrictions. If possible, authors of included studies and experts in the field in various countries were contacted to find out if they know any other published or unpublished controlled trials that assess the effectiveness of case management for persons with substance disorders. National focal points for drug and alcohol research (e.g., National Institute on Alcohol Abuse and Alcoholism (NIAAA), National Institute of Drug Abuse (NIDA), National Drug & Alcohol Research Centre (NDARC), European Monitoring Centre for Drugs and Drug Addiction (EMCDDA)) were contacted for information and advice concerning past and ongoing controlled trials on case management.

METHODS OF THE REVIEW

For conducting the review, two groups of authors (one located in Ghent, Belgium, south group, WV and EB), and one located in Copenhagen, Denmark, and Lund, Sweden, north group, MF and MH) screened and rated the identified and selected studies independently from each other. Below, we indicate with N and S codes who did the specific parts of the review.

1. Study selection (Broekaert, Fridell, Hess, Rapp)
Studies were eligible for selection if:

- a specific model of case management was evaluated. Studies could be selected if the intervention was called case management in the report or article and/or consisted of at least 4 of the 5 basic functions of case management, as defined by an American consensus panel of experts (SAMHSA 1998). If it remained unclear whether an intervention could be considered case management according to our criteria, the original authors of the study were contacted.
- a randomized controlled design was used, in which groups were randomly assigned to the experimental and control group;
- the sample consisted of persons with substance use disorders;
- at least one primary outcome measure, as defined in this protocol, was reported;
- the randomization concerned psychosocial interventions. Trials in which the experimental and control group received different pharmacological interventions were excluded.

Two groups of two authors screened the titles and abstracts of all papers initially identified by the electronic and hand searches, in order to reject studies that clearly did not meet the review's inclusion criteria. Next, the full texts of all studies that were identified as potentially eligible were reviewed. The two groups of authors evaluated independently from each other whether a study should be included or not. In case of any disagreement, a third author (R.C. Rapp) was consulted.
All searches will included literature as well. Studies with English abstracts were assessed for inclusion applying the same strategy and criteria. If a study met the inclusion criteria but was in a language which is not understood by any of the authors, the full text of the manuscript were to be translated.

2. Quality rating
We evaluate the methodological quality of studies using the Methodological Quality Scale (MQS) developed by Miller and co-workers (Miller 2002). This quality rating scale consists of 12 items, covering various methodological aspects of a clinical

trial: method of allocation, means for quality control, follow-up rate, follow-up length, type of follow-up contact, use of collateral information, objective verification of the data, inclusion of treatment dropouts in the analyses, dealing with attrition, use of independent interviewers, statistical analyses are appropriate, application of a multi-site design (*see* Table 01).
In addition, we rated allocation concealment according to the standard Cochrane rating system. This system rates allocation concealment as follows:

A. Low risk of bias: adequate allocation concealment, i.e. central randomization(e.g. allocation by a central office unaware of subject characteristics), pre-numbered or coded identical bottles or containers which are administered serially to participants, drug prepared by the pharmacy, serially numbered, opaque, sealed envelopes, on-site computer system combined with allocations kept in a locked unreadable; computer file that can be accessed only after the characteristics of an enrolled participant have been entered or other description that contained elements convincing of concealment.;
B. Moderate risk of bias: unclear allocation concealment, in which the authors either did not report an allocation concealment approach at all or report an approach that did not fall in the category A or C.
C .High risk of bias: inadequate allocation concealment, such as alternation or reference to case numbers, dates of birth, day of the week. or other systematic approach. Any procedure that is entirely transparent before allocation, such as an open list of random numbers or other description that contained elements convincing of not concealment.
D. Not allocation concealment used: when reviewers have not used this method of rating study quality i.e. for studies which are not randomized or quasi-randomized. This code was not used, as only randomized studies are included in the review.

(Higgins 2006) .We supplemented these ratings with additional information that is particularly relevant for case management, i.e. the degree of linkage, advocacy, pretreatment assessment, and monitoring in 'standard treatment', the use of supervision, and whether a manual was used.
Two teams (south group and north group) conducted quality ratings independently by the two teams, and differences between ratings were discussed until agreement was reached.

3. Extraction (Hesse and Vanderplasschen)
Two raters (WV and MH) independently extracted data. We extracted all relevant data on all outcome measures. For all extracted data, we coded the following information:

- Any relevant data for each of the outcome areas described above: For instance, concerning alcohol use, if a study reported the AUDIT, the ASI alcohol severity, and the percentage of abstinent days for each subject, we registered data that allowed to compute effect sizes for each indicator. Data had to include either means or standard deviations for both the control and experimental group, a proportion for both the control and experimental group or statistics that allow to calculate an effect size, such as a univariate F-statistic, t-statistic or a χ^2-statistic with one degree of freedom. For each outcome measure, we recorded data on the degree of change in the experimental and comparison group, when available.
- Report of any references concerning the validity and reliability of outcome measures: The purpose of this coding was to assess whether outcome measures were likely to be reliable and valid. Lack of such references did not necessarily exclude an outcome measure from the analyses, but each outcome measure that has not been published were to be evaluated by the team. Self-report measures such as questionnaires or interviews that have not been published were generally not to be included in the analyses.
- Sample characteristics: the type of substance(s) used and, eventually, the type of co-morbidity was registered.
- Service characteristics: This included information concerning the model of case management, caseload, monitoring of the quality of the intervention, the integration of case management in the network of services.
- Data omission: We screened whether or not there was any indication that data were omitted for reporting (e.g., urine specimens were taken for several drugs, but only the effect sizes for one drug were reported; ASI interviews were conducted, but only one composite score was reported). The purpose of this coding was to assess the possible impact of reporting bias on the results.
- Proportion of eligible subjects who actually entered the study.

We included all effects reported in the meta-analysis. When data were omitted in a publication about a study, we contacted the authors of the original study to retrieve additional data.

4. Analysis (Hesse)
We conducted analyses separately for each outcome measure. In case multiple indicators were reported that were relevant for a single outcome measure (e.g., days abstinent from alcohol, days of heavy drinking, proportion of abstinent subjects), we performed a within-study meta-analysis to derive a single effect size for each outcome measure for each study. If feasible, measures with unknown or unsatisfactory psychometric properties were dropped from such analyses. Exceptions were: data from registers (e.g., criminal justice records, number of hospital admissions), and data related to persons' living situation (e.g., homeless status, living in temporary accommodation). Also, we used data from urine tests and other biological tests for analyses, even if no specific data on the validity of the test used were provided.
Because the goal of case management is stabilization and improvement of clients' situation rather than (necessarily) recovery, we reported effect sizes as standardized mean differences (SMD).

We calculated all effect sizes separately during and after treatment (6-12 months follow-up).
In case of missing data , we conducted analyses based on the sample size at the follow-up point for which data are present. We used Random effect models to produce aggregate effect sizes.
For continuous measures, we report SMD as effect sizes with Hedge's correction (Higgins 2006). For a single dichotomous measure, engagement in treatment, we analyzed odds ratios as effect sizes. If a dichotomous measure was reported in a study for an outcome measure that was generally reported as continuous in the analyses, odds ratios and χ^2 were transformed into hedge's g using standard formulas.
A reporting or publication bias is a potential source of uncertainty in any meta-analysis. A publication bias emerges, when several indicators reflecting the same construct are measured, but only the statistically significant effects are reported. This will lead to an inflated effect size, although data are available for meta-analysis. We noted whether data have been omitted to make sure that we attempt to retrieve unpublished data. To establish reasonable boundaries on this file drawer problem, we will calculated the number of unavailable (filed or future) studies averaging null results that would reduce our findings to a nonsignificant level (Rosenthal 1991).
Moderator analyses were conducted if Q-tests indicated significant heterogeneity. We did so by subdividing the effect size groupings (outcome areas) further using categorical moderators, where sufficient studies were available (i.e., at least two studies in each category).
In order to identify possible factors influencing the results, we planned a series of subgroup analyses. We intended to perform the following subgroup analyses for primary outcomes:

- Model of case management used: brokerage model, generalist/ intensive case management, assertive community treatment, clinical case management, or strengths-based case management.

- Use of pharmacological treatment: trials in which all participants received opiate agonist treatment (e.g., methadone, buprenorphine or LAAM) vs. studies in which none or only some of the participants received opiate agonist treatment. Opiate agonist treatment differs from other interventions for substance abusers in a number of ways, including a much higher retention. If effects were found in the presence of opiate agonist treatment programs that would indicate that case management can be successfully implemented in such programs. If effects were found in medication free programs, case management can be successfully implemented in such programs.

- Degree of co-occurring mental illness: we intended to compare studies of substance abusers with serious mental illness with studies including substance abusers without serious mental illness, since various studies on case management have focused on so-called "dually diagnosed patients".

- Role of retention and linkage: we intended to compare studies with high effects on retention and linkage (d>=0.4) with studies with low effects on retention and linkage (d<0.4). If high retention and linkage was associated with greater effect sizes, it indicates that the effects of case management are mediated through linkage and retention.

- Degree of change in substance use in the control group ("placebo" response): we intended to compare studies with great improvement in the control group concerning substance use outcomes (d>=0.4 for pre/follow-up) vs. studies with little improvement in the control group on such outcomes (d<0.4 for pre/follow-up). A high degree of change in the control group can be due to client characteristics (e.g., clients entering treatment at a moment when their problems peaked), or to the quality of the services received. In either case, a high degree of change in the control group is likely to mask true effects of case management (Nunes 2004).

- Type of comparison group: studies that compare case management with "treatment as usual" vs. studies that compare it with other viable interventions. While case management may be more effective than referral to regular community or standard services, it may not be differentially more effective than psychotherapy or behavioural interventions, such as contingency management or cognitive-behavioural therapy (Burke 2003; Orwin 1994).

- High vs. low proportion of eligible patients entering the study, based on a "median split": if studies that reported a high proportion of eligible patients entering the study found lower effects, it would indicate that case management is difficult to deliver in "real-world situations", in which agencies are required to provide treatment to patients with multiple and complex problems.

- Quality of the study: comparison of high and low quality studies (low MQS <10 vs. high MQS >=10). A number of reviews have found an inverse relation between the quality of the study and the observed effect size in the literature concerning substance abuse (e.g. Burke 2003; Stanton 1997).

While moderator analyses cannot provide definitive answers to questions about differential effectiveness, they may suggest whether methodological features such as study quality have impacted the observed results (Hesse 2004).
The results of the meta-analysis will be reported in RevMan forest plots.

DESCRIPTION OF STUDIES

Based on the search strategies outlined above, 1230 documents were identified concerning the evaluation of case management and associated interventions for persons with substance use disorders.

Only 78 documents were withheld after a first screening of the abstracts by the two review groups, since most studies concerned another intervention than case management, were not evaluation studies or were applied among other populations than substance abusers. In-depth screening of the 78 selected abstracts led to the acquisition of 51 related studies. Finally, we were able to analyze 15 randomized controlled trials that compared case management with another (non-case management) intervention or standard care, and excluded the remaining 36 studies (see table of excluded studies).

We excluded many studies in the initial screening, because no true randomization was applied for assigning subjects to treatments: in some studies only part of the subjects were randomized, other studies used cluster randomization techniques, or other types of quasi-experimental designs. Also, various studies used 'blended' or 'mixed' interventions, in which case management was part of a more comprehensive intervention, in which case the specific effect of case management could not be disentangled from the effects of the whole treatment package. Some studies had to be excluded since no appropriate outcome measures were reported in available articles. Finally, some studies could not be included, as they compared the effectiveness of two models of case management in the absence of another control intervention. For substantive descriptions of studies *see* 'Characteristics of excluded studies' .

As some of the eligible studies were published as abstracts only or only contained preliminary outcomes, we searched for any subsequent publications in the above-mentioned bibliographical databases and tried to contact the first author of these studies with the same purpose. This led to the identification of two more studies (Corsi 2007; Morgenstern 2006). Furthermore, the reference lists of all retrieved studies and of recently published reviews were scanned for additional relevant publications, which revealed one new study (Zanis 1996) that was not encountered before. In addition, the register of ongoing clinical trials of the US National Institutes of Health was checked, leading to the identification of the German heroin trial, including case management or psycho-education as accompanying psychosocial services (Naber 2006 a; Naber 2006 b), and four additional ongoing trials that were still recruiting patients (Lucas 2007; Ruf 2006) or collecting data (Cartier 2005; Massey 2005; McKay 2002). For two studies, we were able to obtain unpublished data (Corsi 2007; Rapp 2006).

As already mentioned, the various phases of this search process led to the identification of in total 15 randomized and controlled trials that evaluated the effectiveness of case management compared with another intervention or standard care among persons with substance use problems.

In these 15 included studies, a total of 6694 patients were randomized. At follow-up, data were reported for 5546 patients, or 82.9% of all randomized patients. For substantive descriptions of studies *see* 'Characteristics of included studies' .

Countries in which the studies were conducted :

Only one study, with two arms, was conducted in Europe (Naber 2006 a; Naber 2006 b). All remaining studies were from North America.

Treatment regimes and setting

We were able to extract data from 11 studies that compared a model of case management with interventions referred to as 'treatment as usual' or 'standard community services' (Braucht 1995; Coviello 2006; Cox 1998; Martin 1993; Morgenstern 2006; Morse 2006; Rapp 1998; Rhodes 1997; Scott 2002; Sorensen 2005 a; Sorensen 2005 b; Zanis 1996), two studies that compared case management to other active treatments (Corsi 2007; Naber 2006 a; Naber 2006 b), and one study that compared case management to both 'treatment as usual' and another active treatment (Rapp 2006).

Of the studies, three used the brokerage case management model (Corsi 2007; Scott 2002; Zanis 1996), eight studies with ten arms in total, an intensive case management model (Braucht 1995; Coviello 2006; Cox 1998; Morgenstern 2006; Naber 2006 a; Naber 2006 b; Rhodes 1997; Sorensen 2003, Sorensen 2005 a; Sorensen 2005 b), two the strengths-based case management model (Rapp 1998; Rapp 2006), and two studies used assertive community treatment (Martin 1993; Morse 2006).

t is further important to mention that one study included two different conditions: case management with access to vouchers for free MMT and case management without access to vouchers for MMT (Sorensen 2005 a; Sorensen 2005 b). We decided to split up this study into two comparisons: case management vs. 'treatment as usual', and case management + vouchers vs. vouchers alone. Another study reported outcomes separately for two different forms of substitution treatment, i.e., heroin and methadone. In this case, outcomes are reported separately for each medication arm (Naber 2006 a; Naber 2006 b).

Participants

The target population in five studies were opiate dependent persons requiring or receiving substitution treatment (Corsi 2007; Coviello 2006; Naber 2006 a; Naber 2006 b; Sorensen 2005 a; Sorensen 2005 b; Zanis 1996), while the study sample in five other studies concerned a mixed population of drug abusers (mainly opiate and cocaine/crack abusers) (Martin 1993; Morgenstern 2006; Rapp 1998; Rapp 2006; Rhodes 1997; Scott 2002; Sorensen 2003). Two of these studies were conducted in criminal justice settings (Martin 1993; Rhodes 1997). Three studies targeted homeless substance abusers: two predominantly consisted of alcohol abusers (Braucht 1995; Cox 1998), and one recruited substance abusers (mainly alcoholics) with co-occurring mental disorders (Morse 2006).

METHODOLOGICAL QUALITY

When analyzing the results of the assessment of all included studies with the MQS, inter-rater agreement (with two raters (WV and MH) doing the ratings independently) of the full scale was first evaluated. Agreement on the MQS was estimated using maximum

likelihood random effects regression. Inter-rater agreement of the full scale was adequate (ICC=0.82, 95% confidence interval(CI)= 0.63,0.94), with no significant difference between the two raters (p=0.383). Subsequently, all differences were discussed item by item, until an agreement had been reached. Some items showed consistent differences, and a decision had to be made.

Some items showed consistent differences, in order that a decision needed to be made. One of these items was the use of the 'intent-to-treat' sample versus treatment completers only. We decided that even when it was not explicitly mentioned that the full 'intent-to-treat' sample was used for the analyses, we assumed it was done. Another item that showed consistent differences was the use of blinded assessors. In the MQS it is stated that assessors should be both independent and blind to randomization. We decided that if no explicit statement was made that assessors were blind to randomization, a score of zero should be given.

Overall, the methodological quality of the studies varied widely. Assessment of the quality criteria for all included studies can be seen in table 3. MQS-scores ranged from 4-15, with a median of 11.

Two in three studies (n=10) mentioned the use of a manual for guiding the intervention, while eight studies reported some kind of supervision for case managers, in the form of access to senior professionals who could help them stay on track. Characteristics are shown in table 3. Column two lists whether the study reported the use of a manual to guide guide treatment, and whether that manual was published. Column two shows whether supervision from experts in the case management approach was reported for case managers delivering the experimental treatment. Column 3 shows the MSQ score of the study, and column 5 the status of patients at inclusion to treatment.

Only on study was identified that reported allocation concealment adequately (Sorensen 2005 a; Sorensen 2005 b). The exact model of randomization was never mentioned.

In general, statistical reporting and methods description were highly inadequate. Only in seven studies, the number of subjects screened and number eventually randomized were reported (Coviello 2006; Naber 2006 a; Naber 2006 b; Rapp 2006; Sorensen 2003; Sorensen 2005 a; Sorensen 2005 b; Zanis 1996). Some studies did not mention how many patients were randomized to each intervention, although they did report how many patients were followed up in each group (Corsi 2007; Morse 2006).

Of all selected studies, ten reported using some kind of quality control in the form of a manual or service standards for guiding the experimental intervention (Coviello 2006; Martin 1993; Morgenstern 2006; Naber 2006 a; Naber 2006 b; Rapp 1998; Rapp 2006; Sorensen 2003; Sorensen 2005 a; Sorensen 2005 b), but only six reported supervision of case managers (Coviello 2006; Morgenstern 2006; Naber 2006 a; Naber 2006 b; Rapp 1998; Rapp 2006; Sorensen 2003).

Many studies omitted data when reporting the results. Two studies had to be excluded, simply because results were not reported in a format that allowed to extract data for a meta-analysis (e.g. Vaughan 1999; Volpicelli 2000). Furthermore, almost all studies mentioned collecting data on various outcomes that were not reported ultimately.

Follow-up rates were higher than 70% for 8 of the 10 studies that included follow-up interviews. The remaining studies reported outcomes based on case files or records in the absence of follow-up interviews (Braucht 1995; Rapp 2006; Scott 2002; Zanis 1996). Follow-up outcomes of some studies need to be commented further, since for one study only a preliminary reports contained data that could be analyzed, while subsequent publications on the full follow-up sample could not be analyzed (Martin 1993). In another study, a small number of subjects that did not receive any aftercare treatment was excluded from the reported data (Rapp 1998). Consequently, the effect size is constrained to the rest of the subjects. Finally, in one study means of ASI composite scores were reported with only one digit, presumably leading to inflated effect sizes because rounding meant that what may have been small differences became close to half a standard deviation (e.g., a difference between 0.1 and 0.2, and a standard deviation of 0.15) (Sorensen 2003).

RESULTS

Case management versus treatment as usual

Most studies, with the exception of three (Corsi 2007; one arm of Rapp 2006; Naber 2006 a; Naber 2006 b), compared case management with treatment as usual, which is the standard way of referring to treatment or some minimal addition to standard referral procedures.

Concerning primary outcomes, eight comparisons from seven studies were available for illicit drug use (Coviello 2006; Martin 1993; Morgenstern 2006; Rapp 1998; Rhodes 1997; Sorensen 2003; Sorensen 2005 a; Sorensen 2005 b). The overall effect size was SMD 0.12 (CI: -0.06 to 0.29, Z=1.27, p=0.20). Heterogeneity for drug abuse was significant ($\chi^2(7)$=23.25, p=0.002, I^2= 69.9%). The fail-safe number of studies was 0, as the result was nonsignificant.

Alcohol use was available for two studies (Cox 1998; Sorensen 2003). The effect was SMD 0.01 (Z=0.03, NS).

Outcomes concerning legal problems was reported by four studies (Martin 1993; Rapp 1998; Rhodes 1997; Sorensen 2003). The overall effect size was nonsignificant (SMD 0.05, CI=-0.05 to 0.15, Z=1.00, p=0.32), and heterogeneity was nonsignificant ($\chi 2(3)$= 0.06, p=0.97, I^2=0%). All comparisons favoured case management with similar small effect sizes.

Psychiatric symptoms was reported by two studies, showing no difference between experimental and control (Morse 2006; Sorensen 2003). The effect was small and nonsignificant (SMD 0.01, CI= -0.23 to 0.26; Z=0.10, p=0.92). A number of studies apparently have collected data on psychiatric symptoms but not reported them in a fashion that could be analyzed (Coviello 2006; Cox

1998; Naber 2006 a; Naber 2006 b; Morgenstern 2006; Rapp 1998).
Employment outcomes were mentioned by only one study (Cox 1998). The effect was small and non-significant(SMD=0.08, CI= -0.21 to 0.37).
One study reported outcomes on physical health (Sorensen 2003). The effect was small (SMD=0.30, CI=-0.02 to 0.62).
One study reported outcomes on family/social relations (Sorensen 2003). The effect was significant (SMD 0.51, CI=0.18 to 0.83).
Outcomes on living situation was reported by three studies (Cox 1998; Morse 2006; Sorensen 2003). The effect was small, but significant (SMD=0.23, CI=0.01 to 0.44, Z=2.07, p=0.04), and heterogeneity was nonsignificant ($\chi^2(2)=1.69$, p=0.43, $I^2=0\%$).
Concerning secondary outcomes, 11 comparisons from 10 studies were available for successful linkage (Braucht 1995; Coviello 2006; Morgenstern 2006; Rapp 1998; Rapp 2006; Rhodes 1997; Scott 2002; Sorensen 2005 a; Sorensen 2005 b; Zanis 1996). The overall effect size was SMD 0.42 (CI: 0.21 to 0.62, Z=4.01, p<0.0001). Heterogeneity for linkage was significant ($\chi^2(10)=67.44$, p<0.00001, $I^2=85.2\%$).The fail-safe number of studies was 58 using Rosenthal's method.
Since none of the studies reported data on rehospitalization rates that could be extracted, no effect sizes could be computed on this outcome measure. Only one study provided information concerning treatment satisfaction (Morse 2006), showing a non-significant effect that favoured the case management condition (SMD= 0.38, CI=-0.01-0.77).
Four studies reported outcomes on HIV risk behaviour (Coviello 2006; Martin 1993; Rhodes 1997; Sorensen 2003). The effect was small and nonsignificant (SMD=0.04, CI=-0.06 to 0.15, Z=0.79, p=0.43), and heterogeneity was nonsignificant ($\chi^2(3)=1.02$, p= 0.80, $I^2=0\%$).

Case management versus other specific treatments

A total of three studies compared case management with other specific treatments, of which one study was divided into two comparisons, as the groups receiving different medications were reported separately (Corsi 2007; Naber 2006 a, Naber 2006 b, Rapp 2006,). In the German heroin trial, clients were randomized to case management only in a subset of the cities. The results from cities where patients were not randomized to psychosocial treatments were therefore excluded, leaving 711 patients for the analysis (Naber 2006 a; Naber 2006 b).
All of these studies used a less intensive intervention compared with case management, namely variants of motivational interviewing (Corsi 2007; Rapp 2006), or psychoeducation and drug counselling (Naber 2006 a; Naber 2006 b).
Concerning primary outcomes, two comparisons from one study (Naber 2006 a; Naber 2006 b) reported illicit drug use outcomes, and the effect was small, but significant (SMD=0.23, 0.08 to 0.38, Z=3.06, p=0.002). There was no significant heterogeneity ($\chi^2(1)=0.28$, p=0.6).
One study reported alcohol use outcomes (Sorensen 2003), and the results favoured control, but was nonsignificant (SMD=0.21, CI=0.11 to 0.53).
No study reported legal problems.
No study reported psychiatric symptoms.
No study reported HIV risk behaviour.
Two comparisons from one study reported physical health (Naber 2006 a; Naber 2006 b). The effect was nonsignificant, but favoured case management (SMD=0.07, CI=-0.08 to 0.22).
No study reported outcomes of family/social relations.
No study reported outcomes of living situation.
Concerning secondary outcomes, two studies reported linkage outcomes, and the results favoured case management (SMD=0.22, CI=0.08 to 0.38, Z=3.14, p=0.002) (Corsi 2007; Rapp 2006).
One study reported engagement in treatment (Rapp 2006), counted as the proportion of randomized patients who began active treatment, and the results favoured case management (OR= 3.97, CI=2.51 to 6.27).

Moderator analyses

Due to the small number of studies that reported on most outcome measures, only a few of the planned moderator analyses could be conducted. Moreover, these analyses were only conducted for studies using 'treatment as usual' as control condition, and to compare types of control. Moderator analyses were carried out on MetaWin (MetaWin).

Model of case management

Enough studies were available to compare the effect sizes of intensive, brokerage and strengths-based case management. The highest effect was found for strengths-based case management (SMD= 0.70), followed by brokerage (SMD=0.33), and intensive case management (0.19). Differences between types of case management were not significant (between $\chi^2(2)=5.52$, p(random)=0.11; within $\chi^2(9)=8.79$, p=0.27).

Manualized vs. nonmanualized

For manualized versus nonmanualized trials, the effect for manualized trials on linkage was 0.56, and for nonmanulized trials, the effect was 0.14. The between heterogeneity was significant ($\chi^2(1)=9.71$, p(random)=0.014), and the heterogeneity within groups was nonsignificant ($\chi^2(11)=14.1$, p=0.23). The effect on drug use was 0.11 for the manualized trials (CI=-0.13 to 0.34), and for the single study with no manual reporting drug use outcomes, the effect was 0.10 (CI=-0.02,0.22).

Use of pharmacotherapy

Although several studies included patients requiring opioid substitution treatment, most of them concerned patients who were out of treatment when assigned to case management or control.

Degree of co-occuring mental illness

Not enough studies reported on this variable to allow for meaningful comparisons.

High vs. low proportion of eligible patients entering the study

Not enough studies reported on this variable to allow for meaningful comparisons.

High versus low MQS

Effects on linkage were was 0.45 for studies with high MQS (>= 10), and 0.11 for one study with low MQS (<10). No studies with low MQS reported drug use outcomes. We did two unplanned continuous metaregression analyses to substitute for the fact that we could not do the planned categorical analyses. The analyses showed that the effect was nonsignificant for drug use outcomes (slope=0.03, p(random)=0.19), as well as for linkage (slope=0.02, p(random)=0.63).

High versus low linkage

Effects on drug use was 0.12 in two studies reporting small effects on linkage (Rhodes 1997; Sorensen 2005 a; Sorensen 2005 b), and 0.33 in three studies that reported high effects on linkage (Coviello 2006; Morgenstern 2006; Rapp 1998). The difference was in the expected direction, but was not significant (between $\chi^2(1)=2.56$, p(random)=0.23; within $\chi^2(4)=3.45$, p=0.49).

Type of control used

Effects on drug use was 0.12 in the studies that used treatment as usual control and 0.23 in the single study that used another active treatment as control. The combined effect was 0.15 (CI= 0.02 to 0.28, Z=2.21, p=0.03). The difference was not significant (between $\chi^2(1)=0.22$, p(random=0.61; within $\chi^2(10)=11.0$, p= 0.36)

Effects on physical health was reported by 2 studies in total, one with treatment as usual and one with active control. A moderator analysis could not be conducted, but the combined effect was 0.11 (CI=-0.02 to 0.24, Z=1.61, p=0.11).

Effects on linkage was 0.42 in the studies with treatment as usual as control, and 0.22 in the two studies with an active control. The combined effect was 0.38 (CI=0.21 to 0.54, Z=4.45, p<0.00001). The difference was not significant (between $\chi^2(1)=0.59$, p(random)=0.54; within $\chi^2(10)=11.26$, p=0.34)..

DISCUSSION

This meta-analysis concerning the effectiveness of case management for persons with substance use disorders shows that this intervention is effective as a strategy for linking substance abusers to community and treatment services, as compared to treatment as usual or other viable treatment options, such as psycho-education or brief interventions. However, linkage varied significantly between studies. Many factors may influence such outcomes, ranging from the availability of services in the community to the applied model of case management (Vanderplasschen 2004). If community services are either difficult or easy to access, effects of case management may be reduced. In areas where services can easily be accessed, substance abusers in usual care may get a level of services that is close to what case management clients get, whereas in regions where services are very difficult to access, clients may receive few services, even with case management. Other factors that are likely to influence linkage are models of case management, availability of training and supervision, and the degree of integration of case management in the local network of services. Moderator analyses suggested that the use of a manual to guide the case management intervention may be an effective strategy to increase the degree of linkage. Moreover, various authors have identified factors that may enhance linkage such as providing (free) transportation or vouchers for public transport (Laken 1996), case managers' disposing of money to purchase substance abuse treatment services when necessarys ervices (Mejta 1997) or giving clients vouchers for free treatment (Sorensen 2005 a).

This review does not provide convincing support that case management is as effective to reduce illicit drug use. However, findings were highly heterogeneous, and studies that compared case management with other specific treatment showed a small effect on drug use outcomes. Conclusions concerning all other primary outcome measures seem premature and should be taken with some precautions, due to the low number of studies that reported data that could be extracted for a meta-analysis. We found a moderate, significant effect on housing, based on three studies that compared case management with treatment as usual. Conflicting results were also found concerning alcohol use outcomes, but further research is necessary since it only concerned two studies. Four studies have demonstrated small, non-significant, but consistent effects on legal outcomes. Overall, this meta-analysis suffers from the fact that few of the selected studies have systematically reported on various outcome measures. Its illustrative that the study about which we found most references in the literature search (Vaughan 1999)) had to be excluded, since outcome measures were not described in an appropriate way to be calculated in the meta-analysis. Therefore, we hope to get all data on all outcome measures at our disposal for the next update for this review. In addition, a substantial improvement in future studies of case management would be to adopt the consort standard for reporting data.

Also, the methodological quality of the study design was the main reason why several studies were excluded from the meta-analysis. We limited this review to studies that applied true randomization procedures to split up the experimental and control condition, since in the absence of such a design it cannot be guaranteed that differences found between both groups can be attributed to the intervention studied. Furthermore, many authors have studied 'blended' or 'mixed' models of case management in which this intervention was part of a more comprehensive approach.

A number of limitations of studies were also identified. Limitations in the designs identified when going through the literature were were: lack of collateral and objective verification for many outcomes, no reporting on cases lost to follow-up, no independent (blind to randomization) follow-up interviewers, inappropriate data-analyses and a single site-design. To improve the methodological quality of outcome studies on case management, it will therefore be very important to report on true randomization procedures, plan various and also long-term follow-up measurements

and include other outcome measures than solely self-report, if possible at two or more sites.

Although there is little discussion about the main features of case management from a theoretical point of view, its actual practice may vary a lot, resulting in hybrid models of case management (other than the five models presented), poor fidelity to the intended intervention, lower doses of case management than intended and substantial variation within groups regarding dosage. This study shows that efforts to improve the homogeneity of the intervention delivered (e.g., by manualizing case management) may contribute to its effectiveness - as far as linking is concerned - when compared with non-manualized applications. Moreover, recent research has revealed that it is necessary to measure treatment fidelity in order to estimate to what extent the intended intervention has been delivered. Various recent studies have taken into account this issue of fidelity and treatment fidelity appears to make a difference (Morgenstern 2006; Naber 2006 a; Naber 2006 b; Steffanie 2006). Tools to measure case management-fidelity have been developed in the field of mental health care (cf. Drake 1998), but yet do not seem to be applied frequently among substance abusing populations.

Of all planned moderator analyses only few could be performed, because of a lack of studies for most outcome measures and in each group. Some models of case management may be more effective than others and especially the strengths-based perspective appears to be a promising approach. However, the moderator analyses did not show a significant difference between models, although. Tthis may change with future revisions of this review and as new outcomes become available. We could not compare the effect of case management between subjects with and without co-occuring mental disorders, since not enough studies focused on the former population. This may seem strange, since case management is an extensively studied intervention among mental health populations, but few studies have evaluated this intervention among persons with dual disorders. One study did (Drake 1998), but this study was excluded from the analysis since it compared two models of case management, in the absence of another (non-case management) control condition.

AUTHORS' CONCLUSIONS

Implications for practice

Our findings suggest that for substance abusers in search of a variety of services (e.g. concerning employment, substance abuse, health and child care), the implementation of (a specific model of) case management is likely to be effective. However, it seems unlikely that case management directly affects primary outcome measures such as substance use, employment, housing, and criminal activities, given the rather small, and mostly non-significant effects found. If case management is expected to also enhance such outcomes substantially, it should be clear that this intervention cannot replace existing (evidence-based) services in the substance abuse treatment system but rather as a complement and reinforcement of such services.

The strengths-based case management appears to be the most effective model, but has only been tested in two clinical trials by a single research group at Wright State University in Dayton, Ohio. When implementing case management, it is probably necessary to manualize the intervention. Whether training and regular supervision of case managers increase the effectiveness of case management remains to be seen. In addition, it is probably useful to measure case management-fidelity to evaluate if the intervention is delivered as intended.

Although we found some evidence that case management is effective for substance abusing populations, it remains unclear which elements and features make this intervention work. Some authors (Rapp 2006) have suggested that the client-driven approach of setting goals and the nature of the client-case manager relationship play a crucial role, but these hypotheses need to be confirmed in future research.

Implications for research

This meta-analysis shows that case management approaches are - on average - appropriate to link substance abusers with services they need, but the data remain inconclusive concerning most primary outcome indicators. I, in part, this may be perhaps due to a lack of studies that reported on such outcomes, but it can also be partially and in part due to explained by the heterogeneity observed in these observed outcomes. It is obvious that there is still a lot to explain and that large randomized and controlled trials with high methodological quality that take into account a variety of outcome measures over a considerable follow-up period are most suitable for this purpose.

Few studies have addressed to what extent successful linkage acts as a mediator of other (primary) treatment outcomes, such as criminal involvement and drug use (Martin 1993; Rapp 1998). Such research could provide us with information on the mechanisms behind case management as an intervention. Moreover, although some studies have addressed to what extent implementation issues may affect treatment outcomes (Martin 1993; McLellan 1998), research on effective strategies for implementing case management in 'real-life' settings is scarce (compare McLellan 2002). Another issue that has been poorly studied is the effect of case management dosage, since various studies have shown that clients receive varying doses of case management, even in studies with a few case managers or several procedures for standardizing this intervention. It seems that case management dosage is related to problem severity (Vaughan 1999; Naber 2006 a), but it remains unclear if and how it affects outcomes

Aspects of the case management intervention itself that have not been studied sufficiently are whether brief or time-limited case management is effective for some populations and what is the differential effectiveness of various models of case management. As opposed to the field of mental health care (cf. Coldwell 2007;

Ziguras 2000) few studies have compared different models of case management directly, which might also provide more information on what aspects of case management play a role in its effectiveness. Studies that compared models of case management among substance abusers (e.g. Drake 1998; Vaughan 1999) could not be included, since they did not meet the inclusion criteria.
Finally, research on case management should adopt a more strict methodological approach, as well concerning the design and execution of the to both the conduct of research itself, ands to thconcerninge the reporting of outcomes.
We strongly recommend the use of the CONSORT model of reporting trials (Moher 2001). Although a single fairly recent study has followed the CONSORT recommendations (Sorensen 2005 a; Sorensen 2005 b), several studies have not. The use of the CONSORT will may improve reporting of inclusion and exclusion criteria, screening procedure, randomization approach, treatment model used, and outcomes chosen before the conduct of the trial.

POTENTIAL CONFLICT OF INTEREST

Richard C. Rapp is first author and co-author of various RCT's on case management. He will participate as third reviewer in the selection phase and will only be consulted in case of doubt. He will not be involved in the quality rating and data-extraction and data-analysis.
He will be involved in the review process for detecting relevant studies and contacting experts in the field who mainly come from the United States.

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** Indicates the major publication for the study*

TABLES

Characteristics of included studies

Study	**Braucht 1995**
Methods	Randomization: Not reported. Blinding: No blinding measures taken. Completeness of follow-up: all subjects included.
Participants	323 homeless substance abusers, mainly alcohol abusers. 163 were allocated to experimental treatment.
Interventions	Case management supported housing versus housing and treatment as usual
Outcomes	Linkage. Other outcomes collected, but not reported
Notes	Most data omitted from article
Allocation concealment	B – Unclear

Study	**Corsi 2007**
Methods	Randomization: Not reported. Blinding: No blinding measures taken. Completeness of follow-up: 76.5% overall
Participants	642 intravenous drug users recruited through street outreach, age and gender distribution not reported.
Interventions	Case management versus short interventions
Outcomes	Treatment initiation
Notes	Not clear whether other data than treatment admission were collected
Allocation concealment	B – Unclear

Characteristics of included studies (*Continued*)

Study	**Coviello 2006**
Methods	Randomization: Not adequately reported. In 2:1 sequence. Blinding: No blinding reported. Follow-up rate: Control: 97% of experimental and 82% of control
Participants	128 active out of treatment heroin users, 76 were assigned to experimental treatment, 87% male, mean age 45.
Interventions	Brokerage Case Management versus passive referral
Outcomes	SR, urine samples, treatment readmission
Notes	Only drug and readmission data reported, other omitted
Allocation concealment	B – Unclear

Study	**Cox 1998**
Methods	Randomization: Not adequately reported. Blinding: Not reported. Follow-up rate: Varied between 81 and 82% between assessment waves.
Participants	189 homeless chronic public inebriates, 80% male, mean age 43.8, 105 assigned to case management.
Interventions	Case management versus standard community services
Outcomes	Alcohol use, homelessness, employment, alcoholism treatment
Notes	All data reported
Allocation concealment	B – Unclear

Study	**Martin 1993**
Methods	Randomization: Not adequately reported. Blinding: Not reported. Follow-up rate: 72% overall
Participants	455 paroled ex-offenders with a history of intravenous drug use. 72% male, mean age 29, 218 assigned to experimental condition.
Interventions	Assertive community treatment versus. standard parole
Outcomes	Drug use, reoffending, HIV risk behaviour
Notes	Only report from the first 135 patients of 455. No apparent omissions in this report.
Allocation concealment	B – Unclear

Study	**Morgenstern 2006**
Methods	Randomization: Used random number generation and a sealed envelope. Blinding of assessment: Apparently blinded assessors were used. Follow-up: Between 82.4 and 89.1% follow-up interviews completed.
Participants	Women with illicit drug use problems, mean age 36 years, 70% either heroin or cocaine, 161 assigned to experimental condition
Interventions	Intensive case management versus usual care
Outcomes	Abstinence from drug use, succesful linkage to treatment
Notes	Only data on drug use and linkage reported in final article
Allocation concealment	B – Unclear

Characteristics of included studies (*Continued*)

Study	**Morse 2006**
Methods	Randomization: Not reported. Blinding of assessment: Not reported. Follow-up rate: Overall 76%
Participants	149 homeless dual diagnosis patients, 80% male, mean age 40 years, 54 included as experimental, 49 as control, the remaining in a different kind of treatment.
Interventions	Assertive Community treatment versus usual care
Outcomes	A wide range of outcomes
Notes	No apparent data omissions
Allocation concealment	B – Unclear

Study	**Naber 2006 a**
Methods	Randomization: According to previously determined randomization code (block randomization). Blinding of assessment: Not reported Follow-up rate: Apparently around 90%. Subjects lost to follow-up counted as failures.
Participants	361 out-of treatment opioid dependent patients and treatment non-responders, 177 assigned to experiemental condition, 78% male, mean age 35.9
Interventions	Case management and motivational interviewing versus Psychoeducation and drug counselling
Outcomes	Drug use and health
Notes	Subset randomized to heroin maintenance. Only drug use and physical health reported.
Allocation concealment	B – Unclear

Study	**Naber 2006 b**
Methods	Randomization: According to previously determined randomization code (block randomization). Blinding of assessment: Not reported. Follow-up rate: Apparently around 90%.Subjects lost to follow-up counted as failures.
Participants	350 out-of treatment opioid dependent patients and treatment non-responders, 169 assigned to experimental condition, 78% male, mean age 36.9 years.
Interventions	Case management and motivational interviewing versus Psychoeducation and drug counselling
Outcomes	Drug use and health
Notes	Subset randomized to methadone maintenance. Only drug use and physical health reported.
Allocation concealment	B – Unclear

Study	**Rapp 1998**
Methods	Randomization: Not reported. Blinding of assessment: Not used. Follow-up: Experimental: 78%. Control: 73%
Participants	632 veterans with cocaine or heroin use or regular other drug use, 313 in case management, 99% male, mean age 38 years.
Interventions	Strength-based case management versus usual care
Outcomes	Severity of drug use, post-primary treatment participation
Notes	Only data on drug use, linkage and legal problems reported in final article. 34 of 478 patients in ITT sample excluded from report.
Allocation concealment	B – Unclear

Characteristics of included studies (*Continued*)

Study	**Rapp 2006**
Methods	Randomization: Not reported. Blinding: Reported only data based on file records. Follow-up: Reported only data based on file records.
Participants	588 substance abusers after assessment at central intake unit, 190 assigned to experimental condition. 63% male, mean age 33.5 years.
Interventions	Strengths/based case management versus usual care or motivational interviewing
Outcomes	Linkage with other treatment services
Notes	Only data on linkage reported in article.
Allocation concealment	B – Unclear

Study	**Rhodes 1997**
Methods	Randomization: Not reported. Blinding: Not reported. Follow-up: Experimental: 86%. Control: 81%.
Participants	1369 substance abusing arrestees, 74% male, approximately 45% aged 30-39 years, 445 assigned to case management.
Interventions	Brokerage case management versus single session or video
Outcomes	Heavy drug use, treatment entry, legal problems, HIV-risk
Notes	No apparent omissions of data
Allocation concealment	B – Unclear

Study	**Scott 2002**
Methods	Randomization: Not reported. Blinding: Reported data from file records. Follow-up: Reported data from file records.
Participants	692 patients seeking substance abuse treatment presenting at centralized intake unit, 54% male, mean age 34.7 years, 344 assigned to experimental condition.'
Interventions	Case management versus treatment as usual
Outcomes	Show-up for treatment and referral
Notes	No apparent omissions of data
Allocation concealment	B – Unclear

Study	**Sorensen 2003**
Methods	Randomization: Not reported. Blinding: Not reported. Follow-up rate: Experimental: 82%. Control: 77%.
Participants	190 substance abusers with HIV-infection, 92 assigned to case management. 73% were men, mean age was 38.5 years
Interventions	Intensive case management versus brief contact
Outcomes	Opiate use and reentry into methadone detoxification
Notes	No apparent omissions of data
Allocation concealment	B – Unclear

Study	Sorensen 2005 a
Methods	Randomization: Using a computer-generated list stratified by time of day. Follow-up: Case management: 91%. Control: 93%.
Participants	62 drop-outs from a methadone clinic, 77% male, mean age 43 years, 32 assigned to experimental condition.
Interventions	Intensive case management versus usual care, both with vouchers for treatment
Outcomes	Opiate use and reentry into methadone detoxification
Notes	Only drug use, methadone admission, and HIV risk behaviour reported. Other service use reported, but could not be analyzed.
Allocation concealment	A – Adequate

Study	Sorensen 2005 b
Methods	Randomization: Using a computer-generated list stratified by time of day. Follow-up: Case management: 91%. Control: 88%.
Participants	64 drop-outs from a methadone clinic, 77% male, mean age 43 years, 32 assigned to case management intervention.
Interventions	Intensive case management versus. usual care, both without vouchers for treatment
Outcomes	Opiate use and reentry into methadone detoxification
Notes	Only drug use, methadone admission, and HIV risk behaviour reported. Other service use reported, but could not be analyzed.
Allocation concealment	A – Adequate

Study	Zanis 1996
Methods	Randomization: Not reported. Blinding: Not reported. Follow-up rates: Not reported. Data reported apparently from file records.
Participants	41 patients discharged from a methadone maintenance clinic in need of further treatment, all male, mean age 41 years, 27 assigned to experimental condition.
Interventions	Brokerage case management versus treatment as usual
Outcomes	Treatment re-entry
Notes	No apparent omissions of data
Allocation concealment	B – Unclear

Characteristics of excluded studies

Study	Reason for exclusion
Babor 2004	Excluded for the type of intervention not in the inclusion criteria: Case management intervention combined with cognitive behavioural intervention
Bond 1991	Excluded for study design not in the inclusion criteria: Randomization had not taken place for a subset of the sample
Catalano 1999	Excluded for the type of intervention not in the inclusion criteria: Intervention not case management
Chan 2005	Excluded for study design not in the inclusion criteria: Not randomized controlled trial
Conrad 1998	Excluded for the type of intervention not in the inclusion criteria: Case management combined with residential treatment

Characteristics of excluded studies (*Continued*)

Coughey 1998	Excluded for study design not in the inclusion criteria: Observational study
Diamond 2002	Excluded for the type of intervention not in the inclusion criteria: Case management combined with cognitive-behavioural treatment
Drake 1998	Excluded for the type of intervention not in the inclusion criteria: Compares two models of case management
Essock 2006	Excluded for the type of intervention not in the inclusion criteria: Compares two models of case management
Godley 2002	Excluded for the type of intervention not in the inclusion criteria: Intervention combined
Hanlon 1999	Excluded for study design not in the inclusion criteria: Randomization stopped during trial
Heineman 2004	Excluded for study design not in the inclusion criteria: Not randomized controlled trial
Jansson 2003	Excluded for study design not in the inclusion criteria: Quasi-experimental study
Jerrell 1996	Excluded for study design not in the inclusion criteria: Randomization not followed through. At some point during the study, randomization was terminated, and patients assigned by other criterion
Kilbride 2000	Excluded for study design not in the inclusion criteria: Quasi-experimental study
Lapham 1993	Excluded for the type of intervention not in the inclusion criteria: Intervention mixed
Lehman 1993	Excluded for study design not in the inclusion criteria: Quasi-experimental study
Lidz 1992	Excluded for study design not in the inclusion criteria: Quasi-experimental study
McKay 2002	Excluded for study design not in the inclusion criteria: Data could not be retrieved
McLellan 1998	Excluded for study design not in the inclusion criteria: Quasi-experimental study
McLellan 1999	Excluded for study design not in the inclusion criteria: Quasi-experimental study
Mejta 1997	Excluded for the type of intervention not in the inclusion criteria: Case management intervention combined with money available to pay for treatment
Morse 1997	Excluded for the type of participants not in the inclusion criteria: Not all subjects had substance use disorders
Needels 2006	Excluded for the type of participants not in the inclusion criteria: Subjects not required to have substance use disorders
Noel 2006	Excluded for the type of outcomes not in the inclusion criteria: Outcomes reported as multivariate effects only
Robles 2004	Excluded for the type of intervention not in the inclusion criteria: Case management combined with motivational interviewing
Rosenblum 2001	Excluded for study design not in the inclusion criteria: Quasi-experimental study
Ryan 2006	Excluded for study design not in the inclusion criteria: Cluster-randomized trial
Slesnick 2007	Excluded for the type of intervention not in the inclusion criteria
Sosin 1995	Excluded for the type of intervention not in the inclusion criteria
Stahler 1995	Excluded for the type of intervention not in the inclusion criteria: Intervention combined with other interventions
Steffanie 2006	Excluded for study design not in the inclusion criteria: Quasi-experimental study
Vaughan 1999	Excluded for the type of outcomes not in the inclusion criteria: Data not reported in a format that could be analyzed - authors contacted
Volpicelli 2000	Excluded for the type of outcomes not in the inclusion criteria: Data reported in a format that did not allow analysis
Womack 2004	Excluded for study design not in the inclusion criteria: Non-randomized design
Zatzick 2004	Excluded for the type of intervention not in the inclusion criteria: Intervention combined with other interventions

Characteristics of ongoing studies

Study	**Cartier 2005**
Trial name or title	Transitional Case Management Study

Characteristics of ongoing studies (*Continued*)

Participants	Adults who participate in a treatment program within a correctional institution
Interventions	Strengths-based case management vs. Active control
Outcomes	Treatment admission, retention, drug use, legal problems
Starting date	November 2004
Contact information	Jerome Cartier, M.S. 310-445-0874 Ext. 339 jcartier@ucla.edu
Notes	

Study	**Lucas 2007**
Trial name or title	HIV Clinic-Based Treatment With Buprenorphine Versus Referred Care in Heroin-Dependent Participants
Participants	Opioid-dependent, HIV-infected participants
Interventions	Clinic-based treatment vs. case management and referral
Outcomes	Retention to substance abuse treatment. Drug use, health outcomes.
Starting date	November 2005
Contact information	Gregory M. Lucas, MD, PhD 410-614-0560 glucas@jhmi.edu
Notes	

Study	**Massey 2005**
Trial name or title	Services Interventions for Injured ED Problem Drinkers
Participants	ED problem drinkers
Interventions	Strengths Based Case Management or motivational Enhancement Therapy or Brief Informational Feedback
Outcomes	Treatment engagement, alcohol use, health services utilization
Starting date	Not yet open for patient recruitment
Contact information	Lynn S Massey MSW tel: 734-998-7454 ext.: 319 lsmassey@med.umich.edu
Notes	

Study	**Ruf 2006**
Trial name or title	Evaluation of Case Management to Improve the Outpatient Care of Alcohol-Related Disorders
Participants	Alcohol dpendents trated in outpatient settings
Interventions	Comprehensive Quality Management System (CQM) of alcohol-related disorders in primary care
Outcomes	Acceptance of the CQM-system: Number of actively participating practices. Adherence to the system: relative numbers of screened, documented and followed-up patients. Quality of care provided: Patients that are adequately treated and followed-up
Starting date	July 2006
Contact information	Daniela Ruf Dipl. Psych. tel: 0049-761-270-6985 daniela.ruf@uniklinik-freiburg.de
Notes	

ADDITIONAL TABLES

Table 01. The Methodological Quality Scale

Item	Grade
Group allocation	4 = true randomization 3 = within-subject counter-balanced 2 = case control/matching 1 = quasi-experimental design; arbitrary/sequential assignment 0 = violated randomization or non-equivalent groups 4 true randomization 3 within-subject counter-balanced 2 case control/matching 1 quasi-experimental design; arbitrary/sequential assignment 0 violated randomization or non-equivalent groups
Quality control	1 = treatment standardized by manual, specific training, … 0 = no standardization specified
Follow-up rate	2 = 85%-100% of follow-ups completed 1 = 70%-84.9% of follow-ups completed 0 = < 70% of follow-ups completed or follow-up length < 3 months
Follow-up length	2 = 12 months or longer 1 = 6.0-11.9 months 0 = 6 months or unspecified
Contact	1 = personal or telephone contact for 70% of completed follow-ups 0 = questionnaire, unspecified, or < 70% of follow-ups contacted in person or by phone
Collaterals	1 = collaterals (e.g., the client's significant others) interviewed in 50% of the cases 0 = no collateral verification in most cases, or unspecified
Objectivity	1 = objective verification (records, serum, breath, etc.) in 50% of the cases 0 = no objective verification in most cases, or unspecified
Dropout	1 = treatment dropouts included in at least some outcome data (e.g., intent to treat analysis; compared on dependent variable, etc.) 0 = treatment dropouts not discussed or not accounted for (e.g., excluded non-completers from all analyses)
Attrition	1 = cases lost to follow-up enumerated and considered in outcome reporting (e.g., counted as failures, compared with non-attrition cases on prior characteristics) 0 = lost cases not enumerated or merely enumerated but not considered in outcome
Independence	1 = follow-up done by independent interviewer 0 = follow-up non-blind, unspecified, or questionnaire only
Data-analyses	1 = acceptable statistical analyses of group differences 0 = no statistical analyses, inappropriate analyses, or unspecified
Multi-site design	1 = parallel replications at two or more sites with separate research teams 0 = single site or comparison of sites offering different treatments

Table 02. Search strategies for identification of studies

Search strategy

Electronic searches:
Search strategy for MEDLINE database:
1. ((drug or substance$) adj2 (abuse$ or addict$ or dependen$ or misuse)).ti,ab.
2. exp Substance-Related Disorders/
3. 1 or 2
4. cocaine.mp. or exp Cocaine/ or exp Crack Cocaine/
5. exp Heroin/ or heroin
6. (opioid$ or opiate$).ti,ab.
7. alcohol$.ti,ab.
8. exp Narcotics/
9. benzodiazepine.mp. or exp Benzodiazepines/
10. exp Amphetamines/
11. amphetamine.ab,ti.
12. exp Designer drugs/
13. exp Hallucinogens/
14. Hallucinogen$.ti,ab.
15. exp Street drugs/
16. street-drugs.ab,ti.
17. exp Cannabis/
18. cannabis.ab,ti.
19. MARIHUANA.mp.
20. marijuana.ab,ti.
21. exp Opium/
22. Opium.ti,ab.
23. exp Methadone/
24. Methadone.ti,ab.
25. 4/24 OR
26. exp Case Management/
27. (case adj2 management).ti,ab.
28. (assertive adj community).ti,ab.
29. (assertive adj2 continuing).ti,ab.
30. (continuing adj2 care).ti,ab.
31. exp “Continuity of Patient Care”/
32. exp Substance Abuse Treatment Centers/
33. exp patient-centered care/
34. exp managed care programs/
35. (care adj2 programme adj2 approach).tw.
36. 26/35 OR
37. 3 or 25
38. 37 and 36
combined with the phases 1 & 2 of the Cochrane Sensitive Search Strategy for the identification of RCTs as published in Appendix 5b2, Cochrane Handbook for Systematic Reviews of Interventions:
39.randomized controlled trial.pt.
40.randomized controlled trials/
41.controlled clinical trial.pt.
42.random allocation/
43.double blind method/
44.single blind method/

Table 02. Search strategies for identification of studies (*Continued*)

Search strategy

45.39/44 OR
46.clinical trial.pt.
47.exp clinical trials/
48.(clin$ adj trial$).ab,ti.
49.((singl$ or doubl$ or trebl$ or tripl$) adj (blind$ or mask$)).ab,ti
50.exp PLACEBOS/
51.placebo$.ab,ti
52.random$.ab,ti
53.exp Research Design/
54.46/53 OR
55.45 or 54
55. 38 and 55
56. limit 50 to human
Search strategy for EMBASE database:
1.exp addiction/
2.((drug or substance) and (abuse$ or misuse$ or addict$ or dependen$))
3.1 or 2
4.exp cocaine/ or exp cocaine derivative/
5.exp Diamorphine/
6.heroin.ti,ab.
7.*Opiate/
8.exp *Benzodiazepine derivative/ or benzodiazepine$.ti,ab.
9.exp *Amphetamine derivative/ or Amphetamine
10.exp alcohol/ or alcohol.ab,ti.
11.*Cannabis/ or *Cannabis derivative/
12.(marihuana or marijuana).ti,ab.
13.hashish.ti,ab.
14.*Methadone/ or *Methadone treatment/
15.*Street drug/
16.4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15
17.exp patient care/
18.(case adj2 management).ti,ab.
19.exp Mental Health Care/
20.(assertiv$ adj2 communit$).ti,ab.
21.(assertiv$ adj2 continu$).ti,ab.
22.(continui$ adj2 care).ti,ab.
23.exp Drug Dependence Treatment/
24.(care adj2 management).tw.
25.(care adj2 programme adj2 approach).tw.
26.continuity of patient care.tw.
27.17 or 18 or 19 20 or 21 or 22 or 23 or 24 or 25 or 26
28.3 or 16
29.28 and 27
30.random$.ab,ti.
31.placebo.ab,ti.
32.randomized controlled trial/
33.phase-2-clinical-trial/
34.phase-3-clinical-trial/
35.single blind procedure/

Table 02. Search strategies for identification of studies (*Continued*)

Search strategy

36.crossover procedure/
37.Latin square design/
38.exp PLACEBOS/
39.multicenter study/
40.controlled$.sh.
41.30/40 OR
42.29 and 41
43.limit 42 to human
Search strategy for CINAHL database:
1. exp "Substance Use Disorders"/
2. ((drug or substance) and (addict$ or dependen$ or abuse$ or misuse))
3. 1 or 2
4. exp ALCOHOLISM/
5. exp heroin/ or heroin
6. exp NARCOTICS/
7. exp CRACK COCAINE/ or exp COCAINE/
8. cocaine
9. exp Antianxiety Agents/
10. benzodiazepine
11. exp Amphetamines/
12. exp Barbiturates/ or barbiturates
13. exp Designer Drugs/
14. exp HALLUCINOGENS/
15. exp Street Drugs/
16. exp Lysergic Acid Diethylamide/
17. lsd
18. mdma
19. exp Methylenedioxymethamphetamine/
20. ecstasy
21. exp KETAMINE/
22. ketamine
23. exp cannabis/
24. cannabis
25. marihuana or marijuana
26. exp opium/
27. inhalant
28. solvent*
29. (steroid* and abuse)
30. exp anabolic steroids/
31. exp methadone/
32. methadone
33. alcohol
34. 4/33 OR
35. exp Case Management/
36. ((case or care) adj2 management)
37. assertive adj community).ti,ab.
38. exp "Continuity of Patient Care"/
39. (continu$ adj3 care).ti,ab.
40. exp Social Support/

Table 02. Search strategies for identification of studies (*Continued*)

Search strategy

41. 35/40 OR
42. randomi*.tw.
43. clini*.tw.
44. trial*.tw.
45. (clin* and trial*).tw.
46. (singl* or doubl* or tripl* or trebl*) and (mask$ or blind$)
47. crossover.tw.
48. allocate*.tw.
49. assign*.tw.
50. (random)* and (allocate* or assign*)).tw.
51. exp Random Assignment/
52. exp Clinical Trials/
53. 42/52 OR
54. 3 or 34
54. 41 and 54
55. 54 and 53
LILACS (update August 2006)
1.exp Substance-Related Disorders/
2.((drug or substance) and (addict$ or dependen$ or abuse$ or misuse))
3.RANDOM$
4.ALEATORI$ or CASUAL or ACASO or AZAR
5.((DUPLO or DOBLE or SIMPLE or TRIPLO or TRIPLE) and (CEGO or CIEGO)
6.((DOUBL$ or SINGL$ or TRIPL$ or TREBL$) and (BLIND$ or MASK$)
7.SINGLE-MASKED STUDY/
8. DOUBLE-MASKED STUDY/
9.PROPHYLATIC CONTROLLED TRIALS/
10.PLACEBO$ and CONTROL$
11.CLINICAL$ and TRIAL$
12. #1 or #2
13.3/11 OR
14.12 and 13
Toxibase (www.toxibase.org) until September 2004
DRUG DEPENDENCE and case management

Table 03. Additional characteristics of studies

Study	Manualized treatment	Supervision	MSQ	Treatment status
Braucht 1995	No	No	5	Treatment seeking
Corsi 2007	No	No	4	Out of treatment
Coviello 2006	Unpublished	Some	13	Out of treatment
Cox 1998	No	No	10	Treatment seeking
Naber	Published	Intensive	15	Treatment seeking and in-treatment
Martin 1993	Unpublished	No	11	Out of treatment
Morgenstern 2006	Unpublished	Intensive	15	Out-of-treatment

Table 03. Additional characteristics of studies (*Continued*)

Study	Manualized treatment	Supervision	MSQ	Treatment status
Morse 2006	Published	Some	11	Out-of-treatment
Rapp 1998	Published	Some	10	Treatment seeking
Rapp 2006	Published	Some	13	Treatment seeking
Rhodes 1997	No	Some	11	Out-of-treatment
Scott 2002	No	Some	11	Out-of-treatment
Sorensen 2003	Published	Some	14	Out-of-treatment
Sorensen 2005	Published	No	11	Out-of-treatment
Zanis 1996	Unpublished	No	12	Out-of-treatment

ANALYSES

Comparison 01. Case Management versus treatment as usual.

Outcome title	No. of studies	No. of participants	Statistical method	Effect size
01 Illicit drug use outcomes	8	2391	Standardised Mean Difference (Random) 95% CI	0.12 [-0.06, 0.29]
02 Alcohol use outcomes	2	340	Standardised Mean Difference (Random) 95% CI	0.01 [-0.40, 0.42]
04 Legal problems and criminal behaviour	4	1848	Standardised Mean Difference (Random) 95% CI	0.05 [-0.05, 0.14]
05 Psychiatric symptoms	2	254	Standardised Mean Difference (Random) 95% CI	0.01 [-0.23, 0.26]
06 Employment			Standardised Mean Difference (Random) 95% CI	Totals not selected
07 Physical health	1	151	Standardised Mean Difference (Random) 95% CI	0.30 [-0.02, 0.62]
08 Family/social relations			Standardised Mean Difference (Random) 95% CI	Totals not selected
09 Living situation	3	344	Standardised Mean Difference (Random) 95% CI	0.23 [0.01, 0.44]
11 Treatment satisfaction	1	103	Standardised Mean Difference (Random) 95% CI	0.38 [-0.01, 0.77]
12 HIV risk behaviour	4	1516	Standardised Mean Difference (Fixed) 95% CI	0.04 [-0.06, 0.15]
13 Successful linkage	11	3132	Standardised Mean Difference (Random) 95% CI	0.42 [0.21, 0.62]

Comparison 02. Case management versus other specific treatments

Outcome title	No. of studies	No. of participants	Statistical method	Effect size
01 Illicit drug use outcomes	2	711	Standardised Mean Difference (Random) 95% CI	0.23 [0.08, 0.38]
07 Physical health	2	711	Standardised Mean Difference (Random) 95% CI	0.07 [-0.08, 0.22]
08 Successful linkage	2	887	Standardised Mean Difference (Random) 95% CI	0.22 [0.08, 0.35]
12 Engagement in treatment	1	382	Odds Ratio (Random) 95% CI	3.97 [2.51, 6.27]

Comparison 03. Case management comparison of models

Outcome title	No. of studies	No. of participants	Statistical method	Effect size
01 Drug use	8	2391	Standardised Mean Difference (Random) 95% CI	0.20 [0.06, 0.35]
02 Successful linkage	12	3623	Standardised Mean Difference (Random) 95% CI	0.39 [0.20, 0.57]

Comparison 04. Case management versus treatment as usual by follow-up times

Outcome title	No. of studies	No. of participants	Statistical method	Effect size
01 Drug use	10	2544	Standardised Mean Difference (Fixed) 95% CI	0.16 [0.08, 0.24]
02 Successful linkage	14	3661	Standardised Mean Difference (Fixed) 95% CI	0.36 [0.29, 0.42]

Comparison 05. Case management versus treatment as usual by In-treatment versus out-of-treatment patients

Outcome title	No. of studies	No. of participants	Statistical method	Effect size
01 Illicit drug use	8	2546	Standardised Mean Difference (Random) 95% CI	0.21 [0.07, 0.35]
02 Successful Treatment linkage	10	2951	Standardised Mean Difference (Random) 95% CI	0.41 [0.20, 0.62]

Comparison 06. Manualized versus non-manualized

Outcome title	No. of studies	No. of participants	Statistical method	Effect size
01 Successful linkage	12	3235	Standardised Mean Difference (Random) 95% CI	0.44 [0.25, 0.64]
02 Illicit drug use outcomes	8	2390	Standardised Mean Difference (Random) 95% CI	0.12 [-0.06, 0.29]

Comparison 07. Type of control

Outcome title	No. of studies	No. of participants	Statistical method	Effect size
01 Illicit drug use outcomes	10	3102	Standardised Mean Difference (Random) 95% CI	0.15 [0.02, 0.28]
02 Successful linkage	13	4019	Standardised Mean Difference (Random) 95% CI	0.38 [0.21, 0.54]
03 Physical health	3	862	Standardised Mean Difference (Random) 95% CI	0.11 [-0.02, 0.24]

Comparison 08. Low versus high Methodological Quality Scale

Outcome title	No. of studies	No. of participants	Statistical method	Effect size
01 Drug use	7	2280	Standardised Mean Difference (Random) 95% CI	0.21 [0.06, 0.37]
02 Successful linkage	11	3132	Standardised Mean Difference (Random) 95% CI	0.42 [0.21, 0.62]

Comparison 09. High versus low linkage

Outcome title	No. of studies	No. of participants	Statistical method	Effect size
01 Drug use	6	2215	Standardised Mean Difference (Random) 95% CI	0.24 [0.08, 0.41]

COVER SHEET

Title	Case management for persons with substance use disorders
Authors	Hesse M, Vanderplasschen W, Rapp RC, Broekaert E, Fridell M
Contribution of author(s)	All authors met and discussed the definition of case management, primary and secondary outcomes to be considered, and contributed to the production of the protocol. Two groups of two reviewers screened the titles and abstracts of all papers initially identified by electronic and hand searches, in order to exclude studies that clearly do not meet the review's inclusion criteria. Next, full texts of all studies that were identified as potentially eligible were studied. The two groups of reviewers evaluated independently from each other whether a study could be included or not. In case of disagreement, a third reviewer (R.C. Rapp) was consulted. For conducting the review, two groups of reviewers (one located in Ghent (Belgium), referred to as the 'S' group (WV+EB), and one located in Copenhagen (Denmark) and Lund (Sweden) (MH + MF), called the 'N' group) screened, rated the quality of and extracted data from the selected studies independently from each other. Data-analyses were performed by the first author of the review.
Issue protocol first published	2006/4
Review first published	2007/4
Date of most recent amendment	09 August 2007
Date of most recent SUBSTANTIVE amendment	07 August 2007
What's New	Information not supplied by author

Date new studies sought but none found	Information not supplied by author
Date new studies found but not yet included/excluded	Information not supplied by author
Date new studies found and included/excluded	Information not supplied by author
Date authors' conclusions section amended	Information not supplied by author
Contact address	Morten Hesse Centre for Alcohol and Drug Research Købmagergade 26 E København C 1150 DENMARK E-mail: mortenhesse@crf.dk Tel: 33 32 73 00
DOI	10.1002/14651858.CD006265.pub2
Cochrane Library number	CD006265
Editorial group	Cochrane Drugs and Alcohol Group
Editorial group code	HM-ADDICTN

GRAPHS AND OTHER TABLES

Analysis 01.01. Comparison 01 Case Management versus treatment as usual., Outcome 01 Illicit drug use outcomes

Review: Case management for persons with substance use disorders

Comparison: 01 Case Management versus treatment as usual.

Outcome: 01 Illicit drug use outcomes

Study	Treatment N	Treatment Mean(SD)	Control N	Control Mean(SD)	Standardised Mean Difference (Random) 95% CI	Weight (%)	Standardised Mean Difference (Random) 95% CI
Coviello 2006	71	0.10 (1.00)	40	0.00 (1.00)		10.4	0.10 [-0.29, 0.49]
Martin 1993	56	-0.02 (1.00)	63	0.00 (1.00)		11.2	-0.02 [-0.38, 0.34]
Morgenstern 2006	135	0.58 (1.00)	156	0.00 (1.00)		15.2	0.58 [0.34, 0.81]
Rapp 1998	249	0.24 (1.00)	228	0.00 (1.00)		17.1	0.24 [0.06, 0.42]
Rhodes 1997	395	0.10 (1.00)	734	0.00 (1.00)		18.9	0.10 [-0.02, 0.22]
Sorensen 2003	80	0.00 (1.00)	71	0.28 (1.00)		12.4	-0.28 [-0.60, 0.04]
Sorensen 2005 a	28	0.03 (1.00)	29	0.00 (1.00)		7.5	0.03 [-0.49, 0.55]
Sorensen 2005 b	28	0.00 (1.00)	28	0.11 (1.00)		7.4	-0.11 [-0.63, 0.42]
Total (95% CI)	1042		1349			100.0	0.12 [-0.06, 0.29]

Test for heterogeneity chi-square=23.25 df=7 p=0.002 I^2 =69.9%

Test for overall effect z=1.27 p=0.2

Analysis 01.02. Comparison 01 Case Management versus treatment as usual., Outcome 02 Alcohol use outcomes

Review: Case management for persons with substance use disorders

Comparison: 01 Case Management versus treatment as usual.

Outcome: 02 Alcohol use outcomes

Study	Treatment N	Treatment Mean(SD)	Control N	Control Mean(SD)	Standardised Mean Difference (Random) 95% CI	Weight (%)	Standardised Mean Difference (Random) 95% CI
Cox 1998	105	0.21 (1.00)	84	0.00 (1.00)		51.5	0.21 [-0.08, 0.50]
Sorensen 2003	80	0.00 (1.00)	71	0.21 (1.00)		48.5	-0.21 [-0.53, 0.11]
Total (95% CI)	185		155			100.0	0.01 [-0.40, 0.42]

Test for heterogeneity chi-square=3.62 df=1 p=0.06 I^2 =72.4%

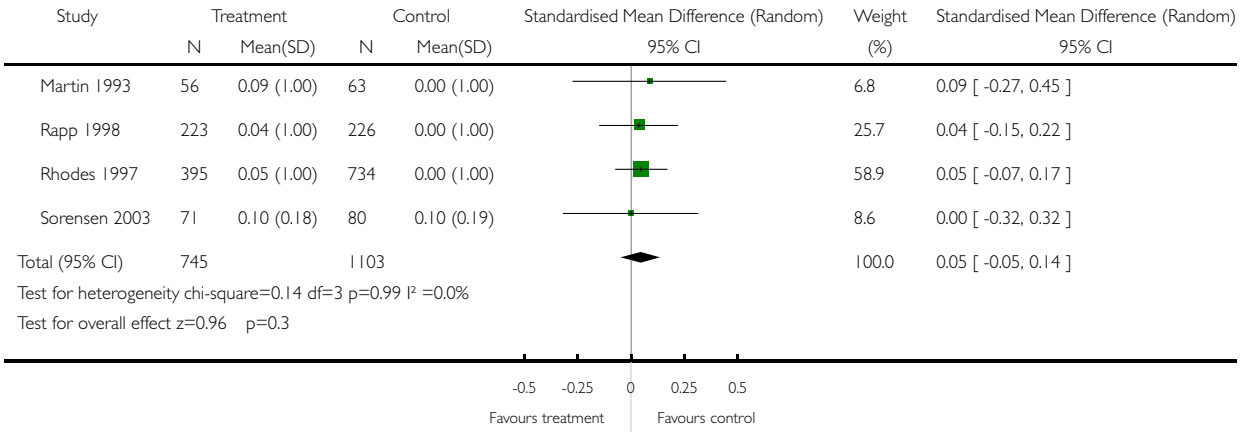
Test for overall effect z=0.03 p=1

Analysis 01.04. Comparison 01 Case Management versus treatment as usual., Outcome 04 Legal problems and criminal behaviour

Review: Case management for persons with substance use disorders

Comparison: 01 Case Management versus treatment as usual.

Outcome: 04 Legal problems and criminal behaviour

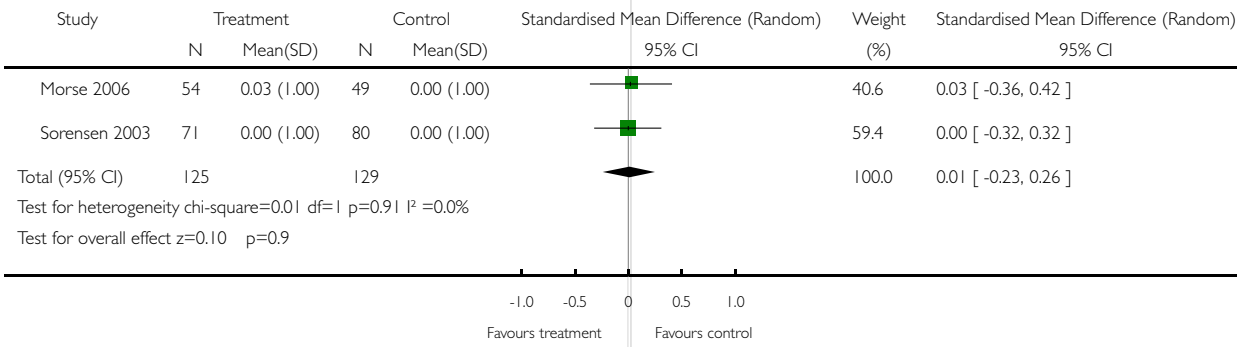


Analysis 01.05. Comparison 01 Case Management versus treatment as usual., Outcome 05 Psychiatric symptoms

Review: Case management for persons with substance use disorders

Comparison: 01 Case Management versus treatment as usual.

Outcome: 05 Psychiatric symptoms

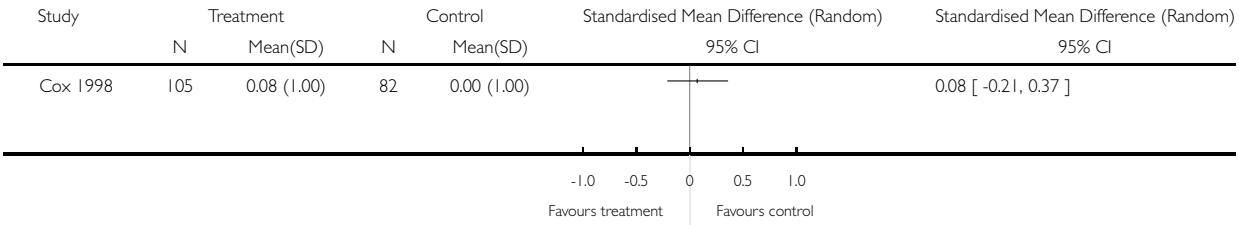


Analysis 01.06. Comparison 01 Case Management versus treatment as usual., Outcome 06 Employment

Review: Case management for persons with substance use disorders

Comparison: 01 Case Management versus treatment as usual.

Outcome: 06 Employment

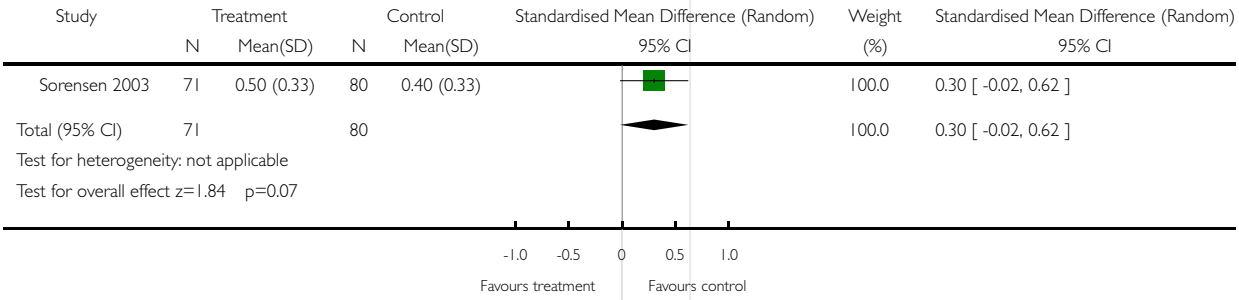


Analysis 01.07. Comparison 01 Case Management versus treatment as usual., Outcome 07 Physical health

Review: Case management for persons with substance use disorders

Comparison: 01 Case Management versus treatment as usual.

Outcome: 07 Physical health

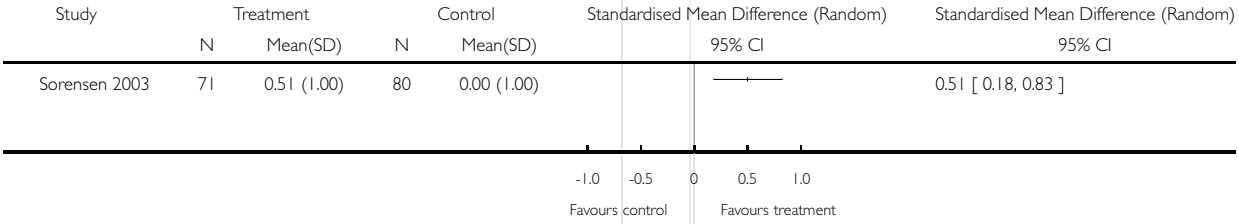


Analysis 01.08. Comparison 01 Case Management versus treatment as usual., Outcome 08 Family/social relations

Review: Case management for persons with substance use disorders

Comparison: 01 Case Management versus treatment as usual.

Outcome: 08 Family/social relations

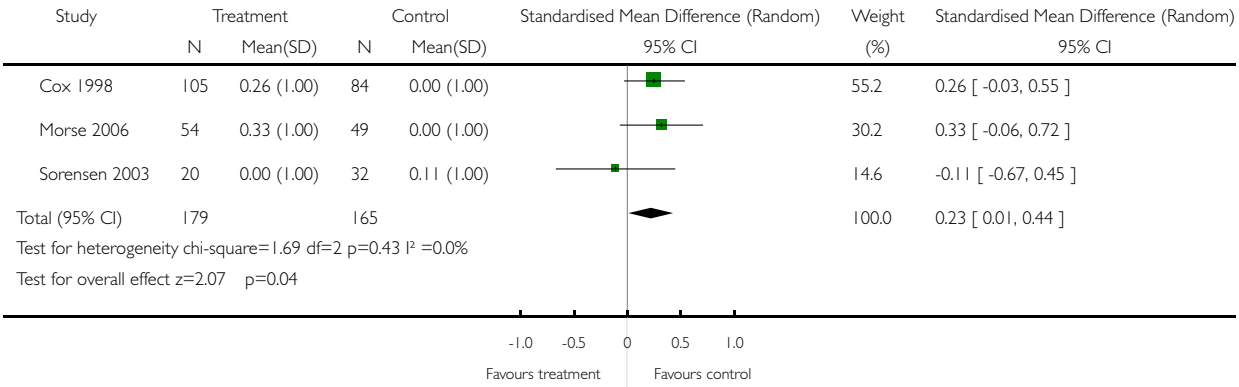


Analysis 01.09. Comparison 01 Case Management versus treatment as usual., Outcome 09 Living situation

Review: Case management for persons with substance use disorders

Comparison: 01 Case Management versus treatment as usual.

Outcome: 09 Living situation

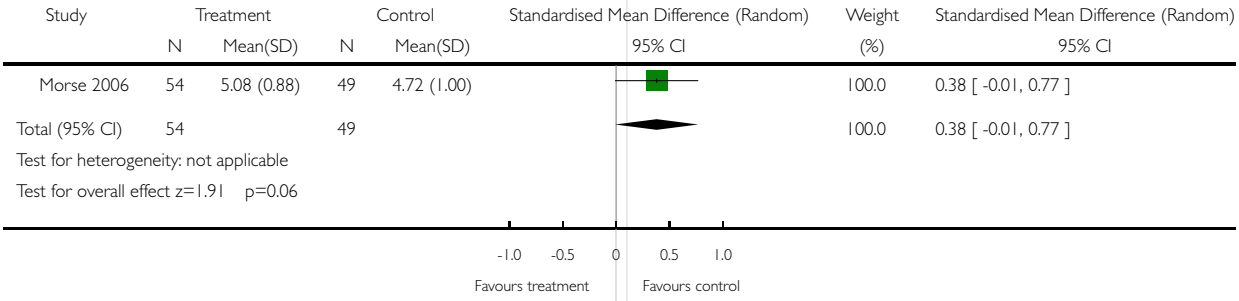


Analysis 01.11. Comparison 01 Case Management versus treatment as usual., Outcome 11 Treatment satisfaction

Review: Case management for persons with substance use disorders

Comparison: 01 Case Management versus treatment as usual.

Outcome: 11 Treatment satisfaction

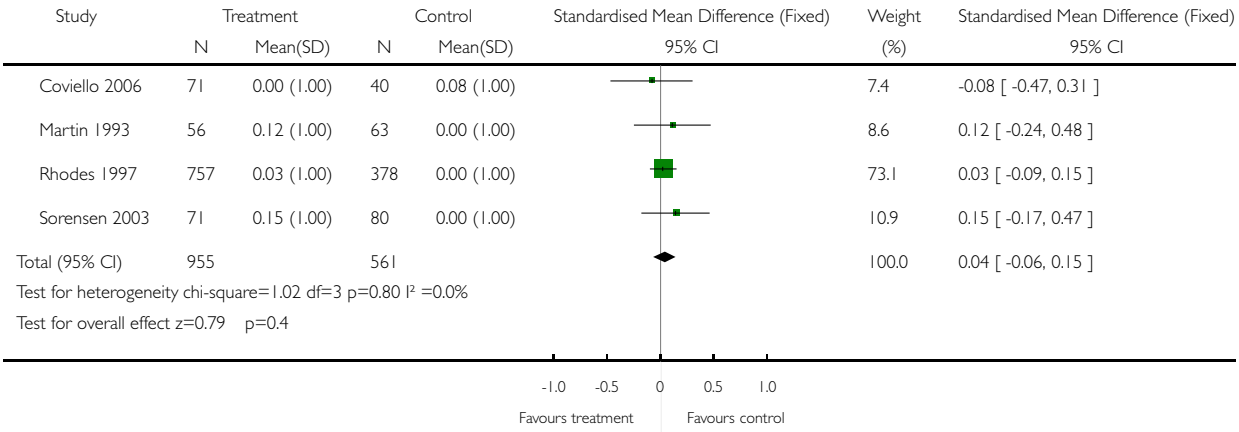


Analysis 01.12. Comparison 01 Case Management versus treatment as usual., Outcome 12 HIV risk behaviour

Review: Case management for persons with substance use disorders

Comparison: 01 Case Management versus treatment as usual.

Outcome: 12 HIV risk behaviour

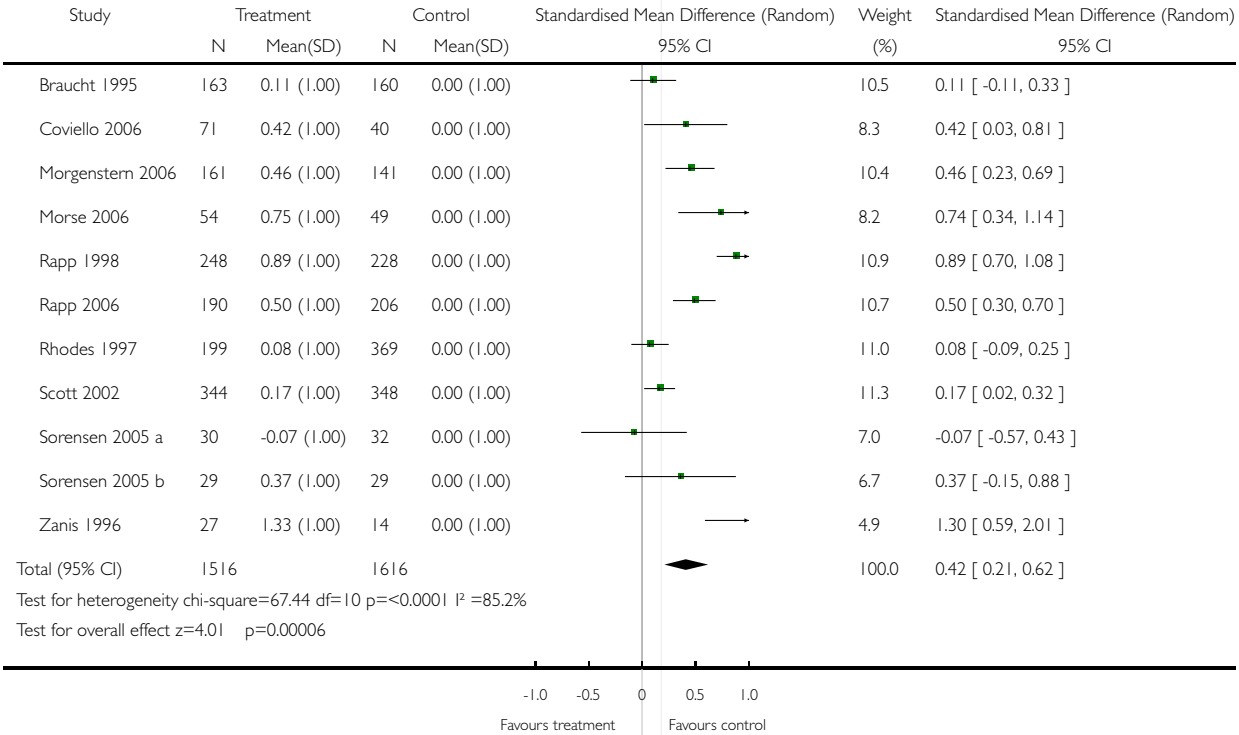


Analysis 01.13. Comparison 01 Case Management versus treatment as usual., Outcome 13 Successful linkage

Review: Case management for persons with substance use disorders

Comparison: 01 Case Management versus treatment as usual.

Outcome: 13 Successful linkage

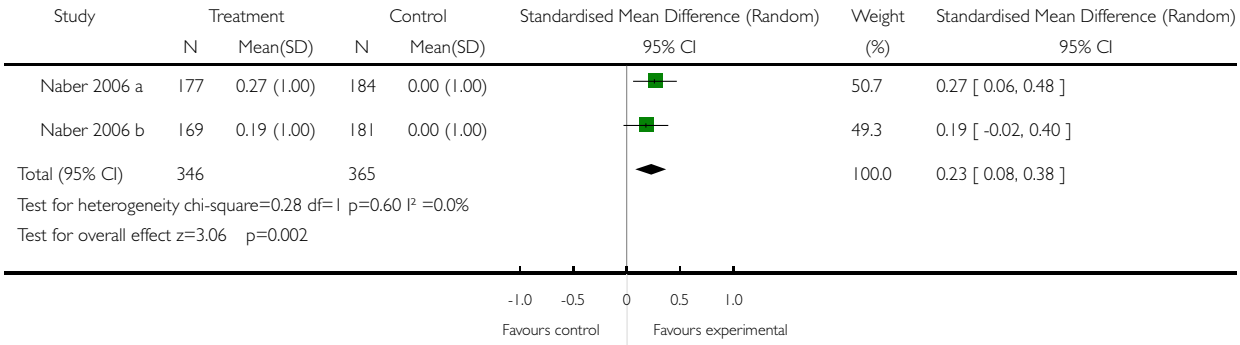


Analysis 02.01. Comparison 02 Case management versus other specific treatments, Outcome 01 Illicit drug use outcomes

Review: Case management for persons with substance use disorders

Comparison: 02 Case management versus other specific treatments

Outcome: 01 Illicit drug use outcomes

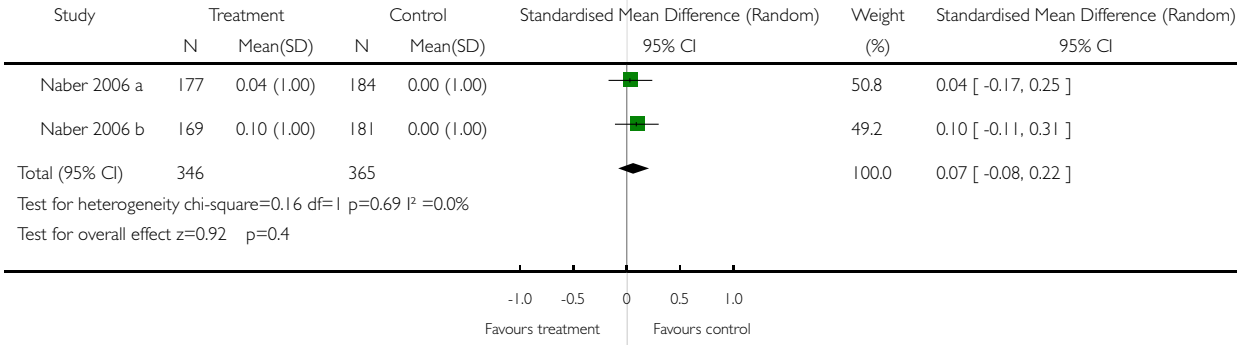


Analysis 02.07. Comparison 02 Case management versus other specific treatments, Outcome 07 Physical health

Review: Case management for persons with substance use disorders

Comparison: 02 Case management versus other specific treatments

Outcome: 07 Physical health

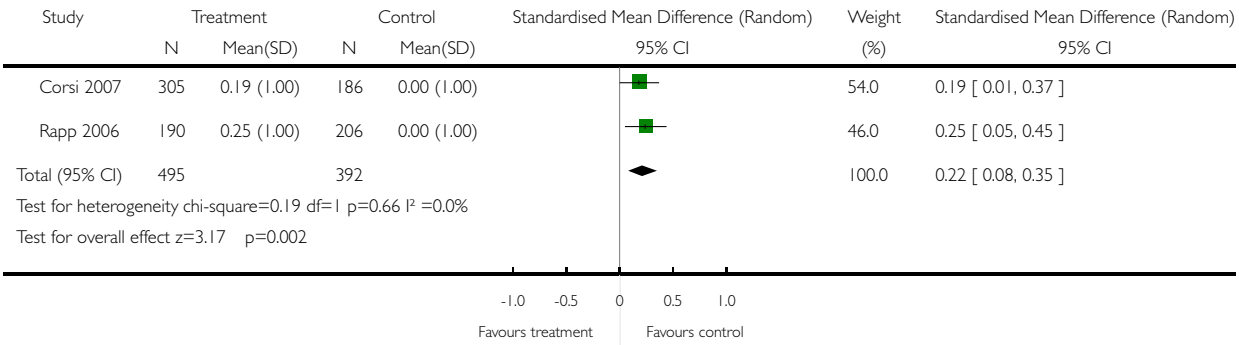


Analysis 02.08. Comparison 02 Case management versus other specific treatments, Outcome 08 Successful linkage

Review: Case management for persons with substance use disorders

Comparison: 02 Case management versus other specific treatments

Outcome: 08 Successful linkage

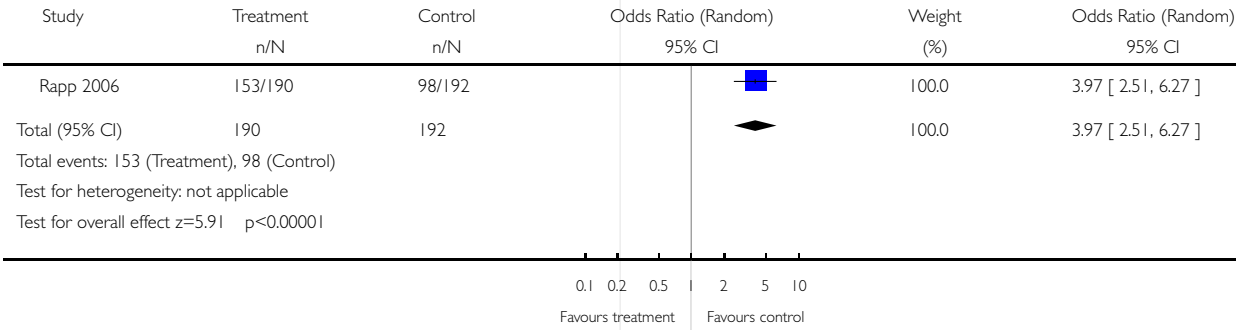


Analysis 02.12. Comparison 02 Case management versus other specific treatments, Outcome 12 Engagement in treatment

Review: Case management for persons with substance use disorders

Comparison: 02 Case management versus other specific treatments

Outcome: 12 Engagement in treatment

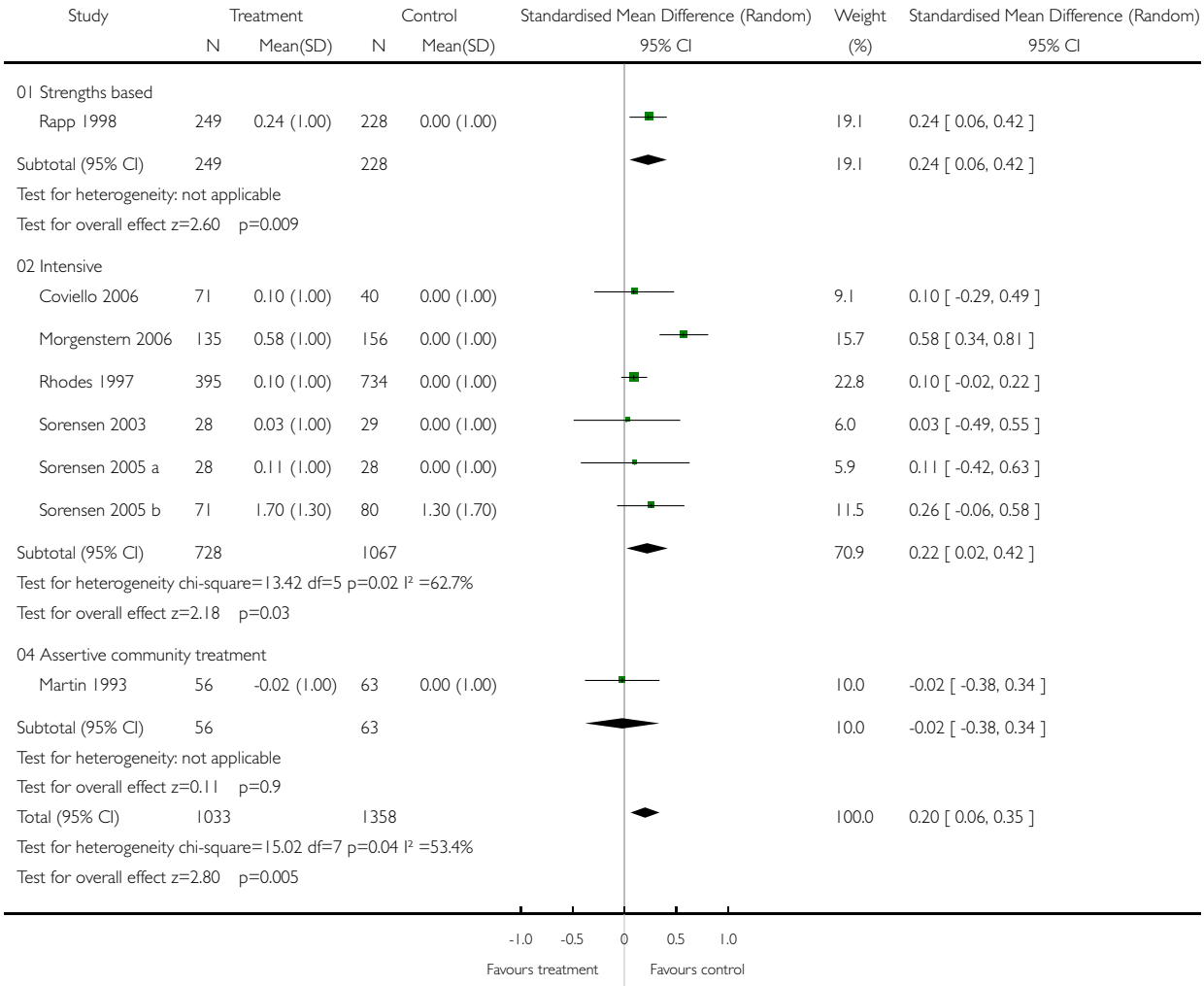


Analysis 03.01. Comparison 03 Case management comparison of models, Outcome 01 Drug use

Review: Case management for persons with substance use disorders

Comparison: 03 Case management comparison of models

Outcome: 01 Drug use

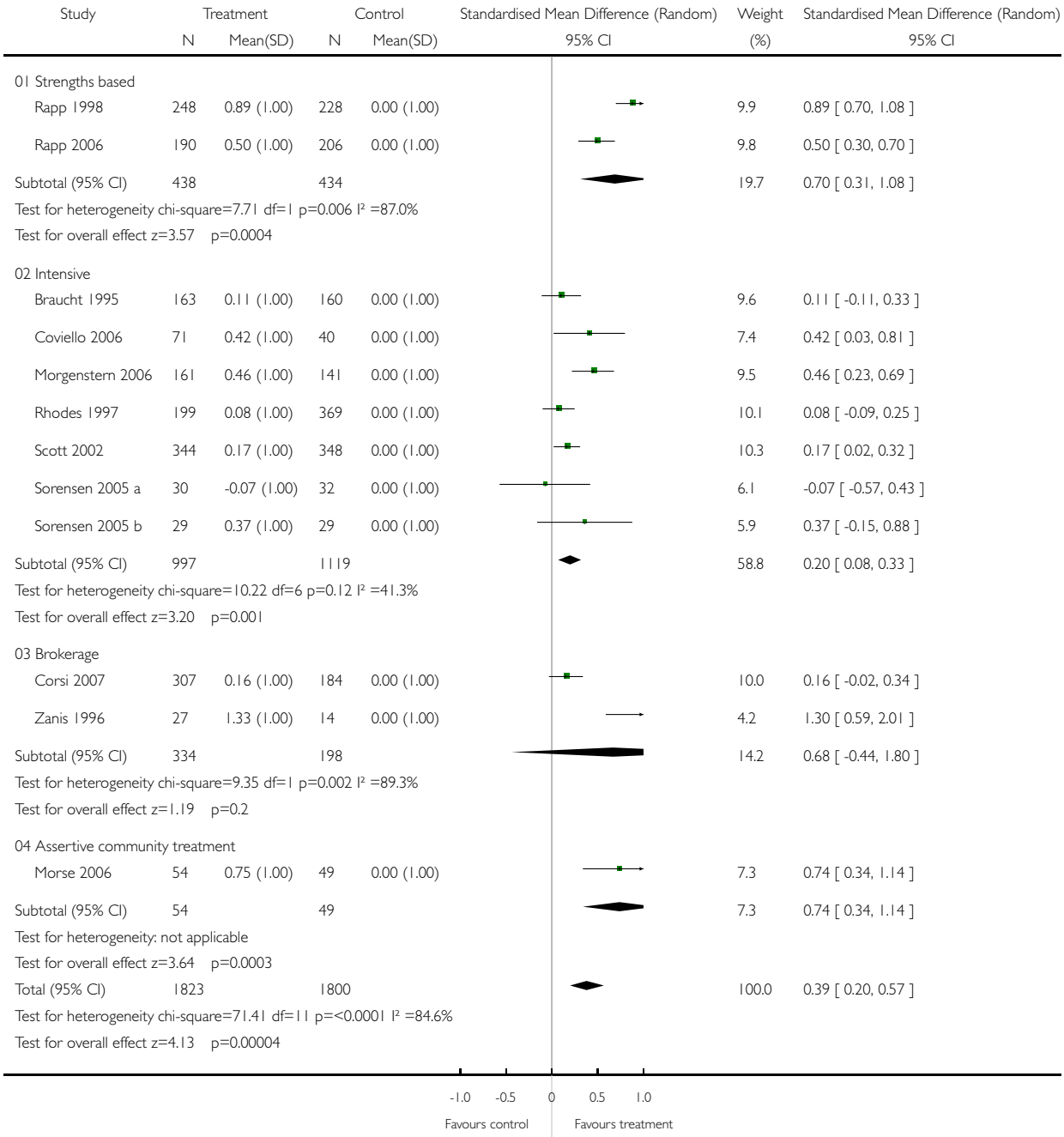


Analysis 03.02. Comparison 03 Case management comparison of models, Outcome 02 Successful linkage

Review: Case management for persons with substance use disorders

Comparison: 03 Case management comparison of models

Outcome: 02 Successful linkage

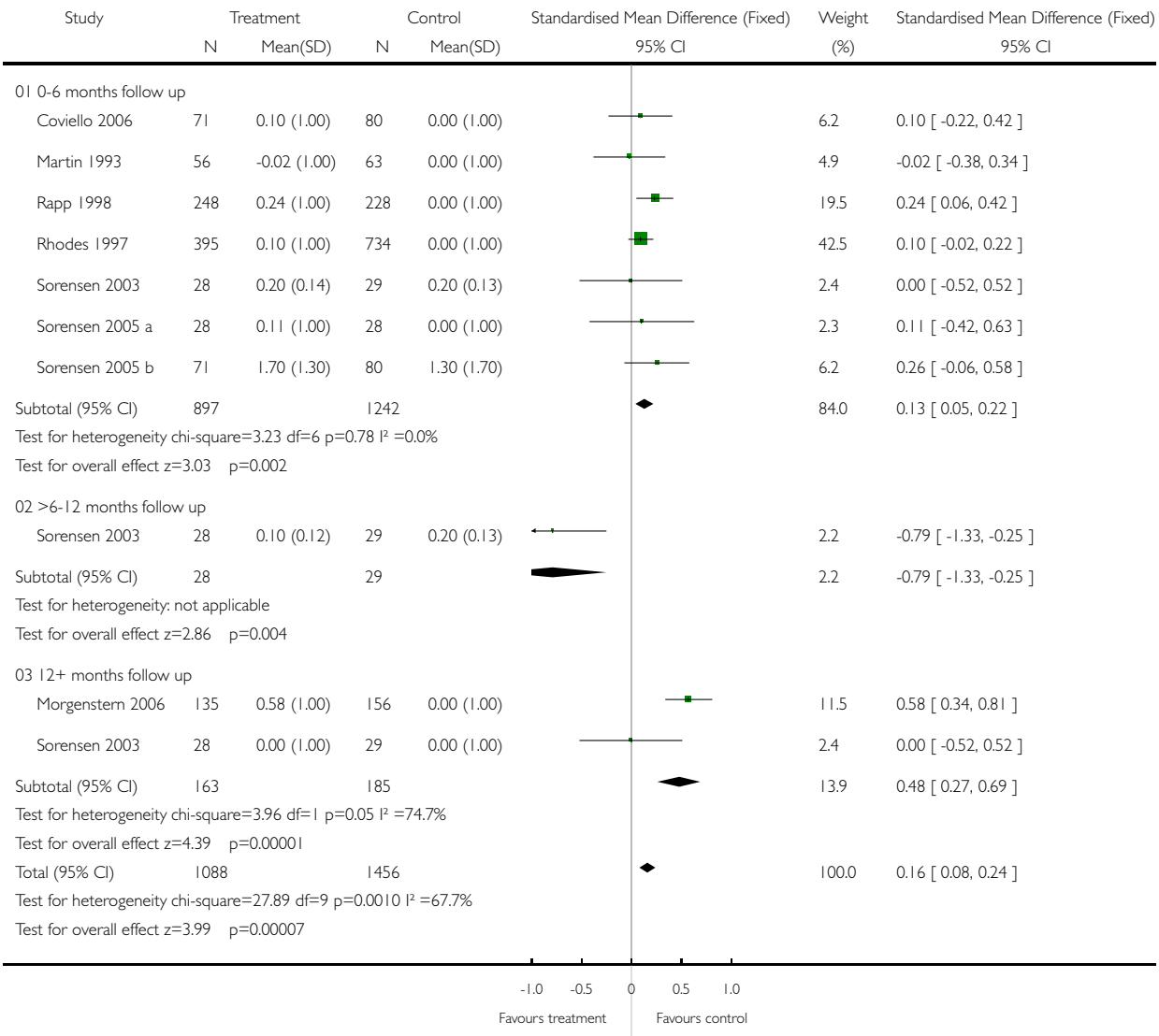


Analysis 04.01. Comparison 04 Case management versus treatment as usual by follow-up times, Outcome 01 Drug use

Review: Case management for persons with substance use disorders

Comparison: 04 Case management versus treatment as usual by follow-up times

Outcome: 01 Drug use

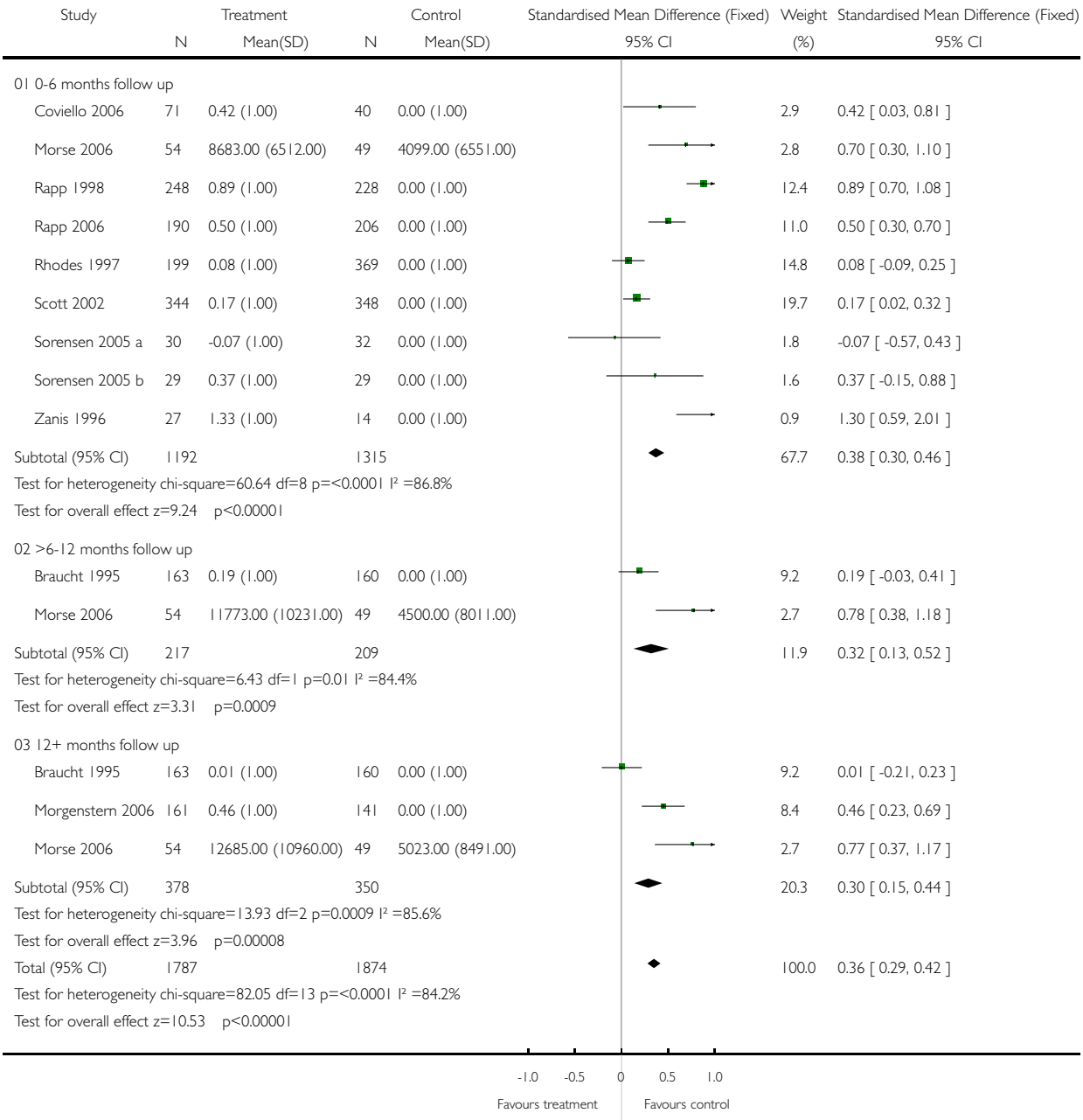


Analysis 04.02. Comparison 04 Case management versus treatment as usual by follow-up times, Outcome 02 Successful linkage

Review: Case management for persons with substance use disorders

Comparison: 04 Case management versus treatment as usual by follow-up times

Outcome: 02 Successful linkage

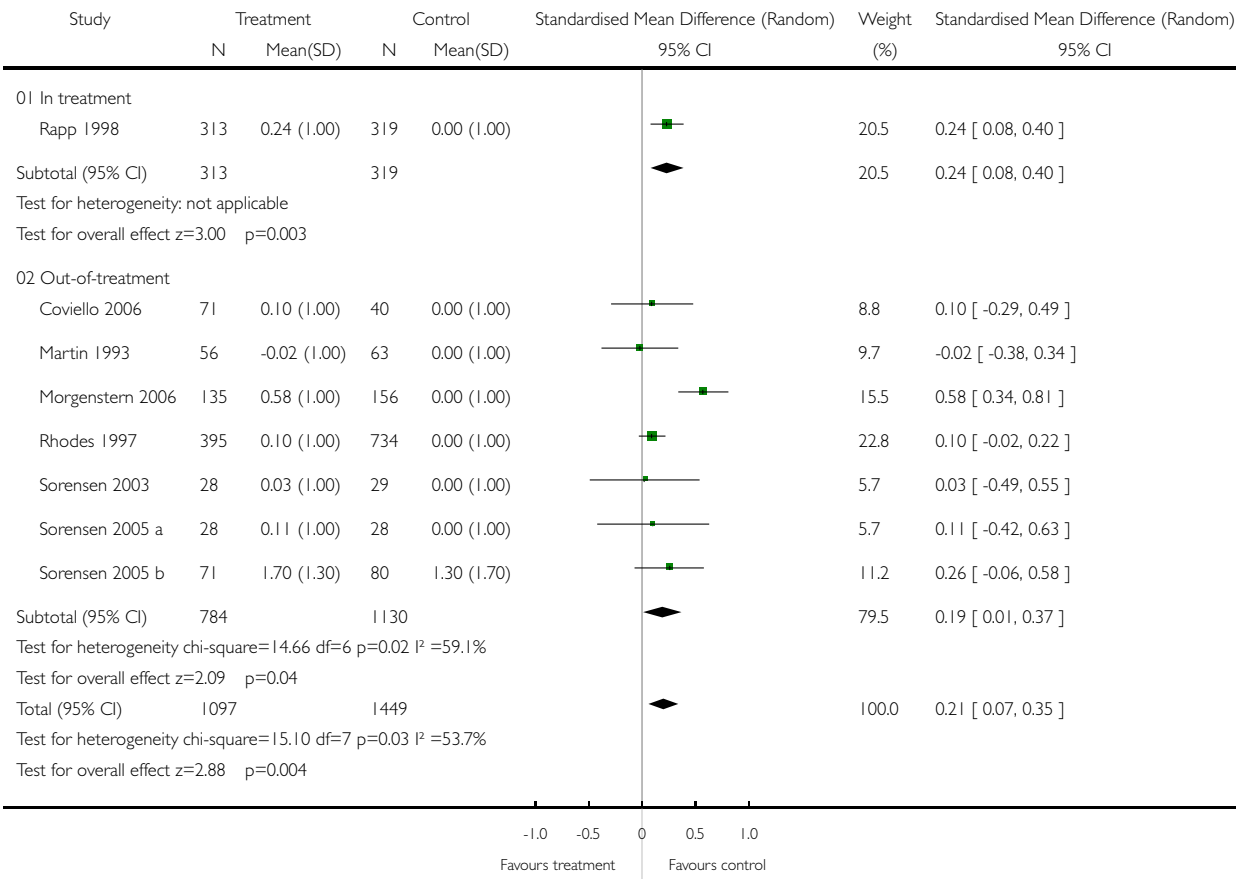


Analysis 05.01. Comparison 05 Case management versus treatment as usual by In-treatment versus out-of-treatment patients, Outcome 01 Illicit drug use

Review: Case management for persons with substance use disorders

Comparison: 05 Case management versus treatment as usual by In-treatment versus out-of-treatment patients

Outcome: 01 Illicit drug use



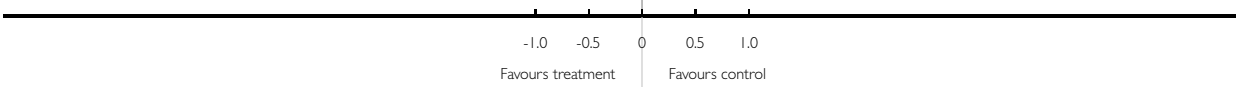
Analysis 05.02. Comparison 05 Case management versus treatment as usual by In-treatment versus out-of-treatment patients, Outcome 02 Successful Treatment linkage

Review: Case management for persons with substance use disorders

Comparison: 05 Case management versus treatment as usual by In-treatment versus out-of-treatment patients

Outcome: 02 Successful Treatment linkage

Study	Treatment N	Treatment Mean(SD)	Control N	Control Mean(SD)	Standardised Mean Difference (Random) 95% CI	Weight (%)	Standardised Mean Difference (Random) 95% CI
01 In treatment							
Rapp 1998	313	0.89 (1.00)	319	0.00 (1.00)		11.8	0.89 [0.73, 1.05]
Subtotal (95% CI)	313		319			11.8	0.89 [0.73, 1.05]
Test for heterogeneity: not applicable							
Test for overall effect z=10.66 p<0.00001							
02 Out-of-treatment							
Coviello 2006	71	0.42 (1.00)	40	0.00 (1.00)		8.7	0.42 [0.03, 0.81]
Morgenstern 2006	161	0.46 (1.00)	141	0.00 (1.00)		11.0	0.46 [0.23, 0.69]
Morse 2006	54	0.75 (1.00)	49	0.00 (1.00)		8.6	0.74 [0.34, 1.14]
Rapp 2006	190	0.50 (1.00)	206	0.00 (1.00)		11.4	0.50 [0.30, 0.70]
Rhodes 1997	199	0.08 (1.00)	369	0.00 (1.00)		11.7	0.08 [-0.09, 0.25]
Sorensen 2005 a	30	-0.07 (1.00)	32	0.00 (1.00)		7.3	-0.07 [-0.57, 0.43]
Sorensen 2005 b	29	0.37 (1.00)	29	0.00 (1.00)		7.1	0.37 [-0.15, 0.88]
Subtotal (95% CI)	734		866			65.7	0.36 [0.16, 0.56]
Test for heterogeneity chi-square=18.82 df=6 p=0.004 I^2 =68.1%							
Test for overall effect z=3.54 p=0.0004							
03 Treatment seeking							
Braucht 1995	163	0.11 (1.00)	160	0.00 (1.00)		11.1	0.11 [-0.11, 0.33]
Rapp 2006	190	0.50 (1.00)	206	0.00 (1.00)		11.4	0.50 [0.30, 0.70]
Subtotal (95% CI)	353		366			22.5	0.31 [-0.07, 0.69]
Test for heterogeneity chi-square=6.64 df=1 p=0.010 I^2 =84.9%							
Test for overall effect z=1.58 p=0.1							
Total (95% CI)	1400		1551			100.0	0.41 [0.20, 0.62]
Test for heterogeneity chi-square=61.52 df=9 p=<0.0001 I^2 =85.4%							
Test for overall effect z=3.89 p=0.0001							

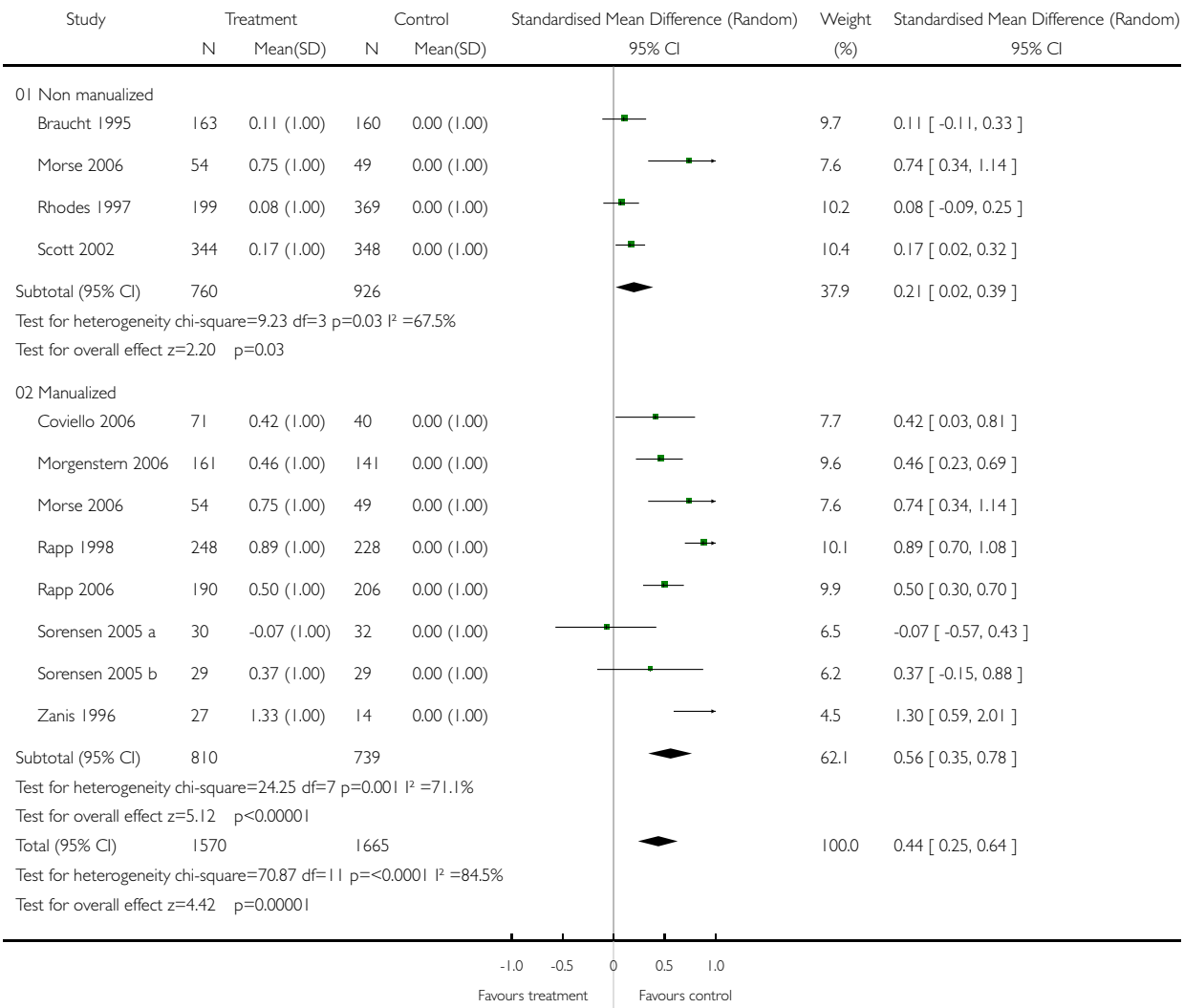


Analysis 06.01. Comparison 06 Manualized versus non-manualized, Outcome 01 Successful linkage

Review: Case management for persons with substance use disorders

Comparison: 06 Manualized versus non-manualized

Outcome: 01 Successful linkage

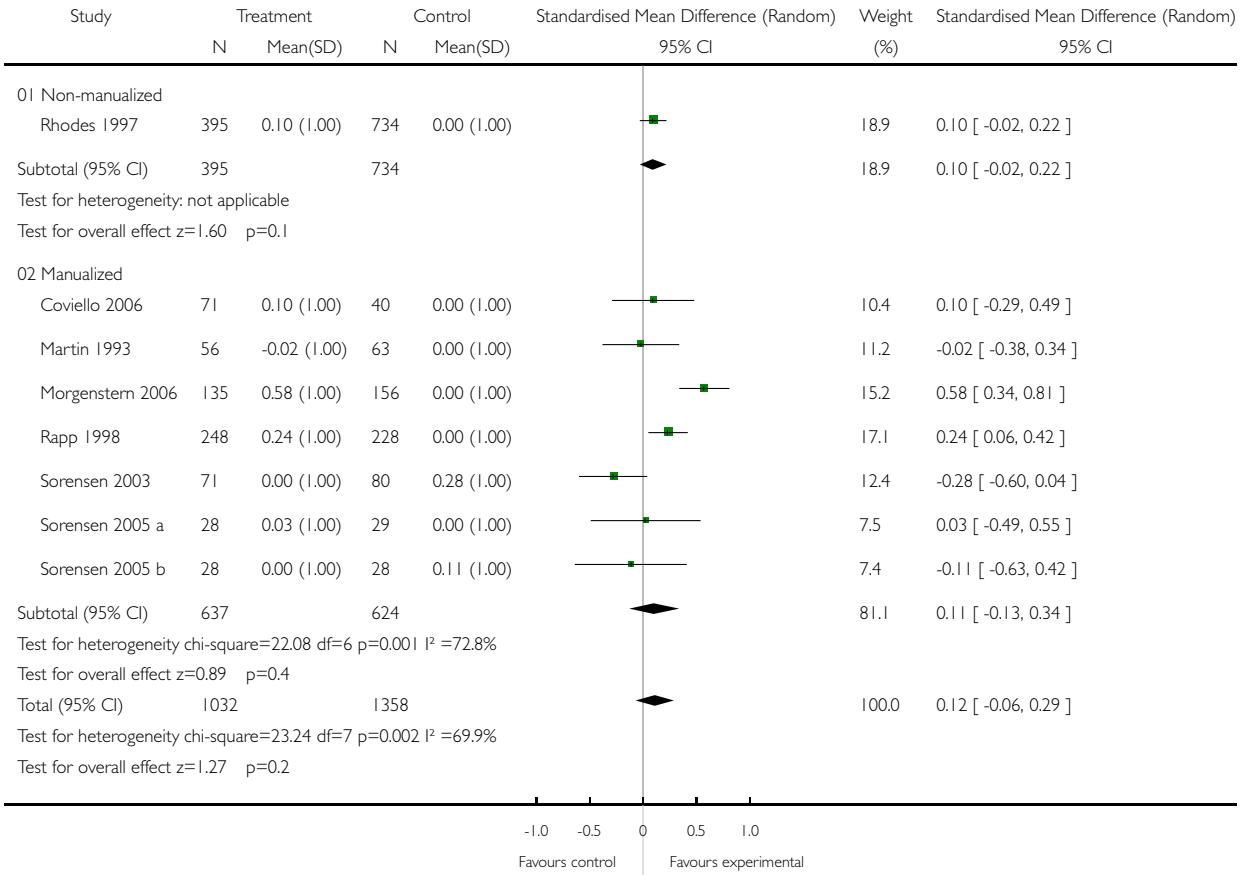


Analysis 06.02. Comparison 06 Manualized versus non-manualized, Outcome 02 Illicit drug use outcomes

Review: Case management for persons with substance use disorders

Comparison: 06 Manualized versus non-manualized

Outcome: 02 Illicit drug use outcomes

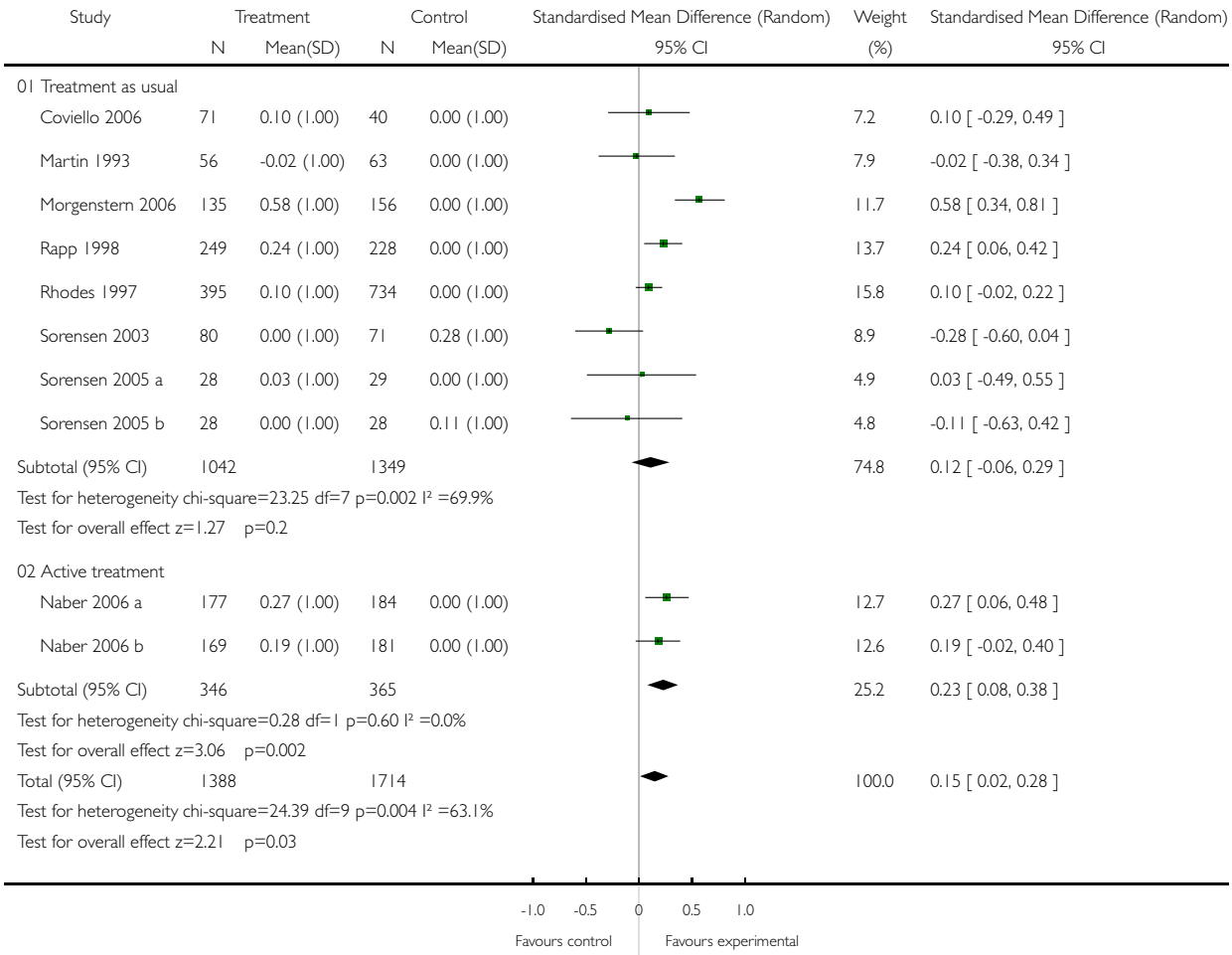


Analysis 07.01. Comparison 07 Type of control, Outcome 01 Illicit drug use outcomes

Review: Case management for persons with substance use disorders

Comparison: 07 Type of control

Outcome: 01 Illicit drug use outcomes

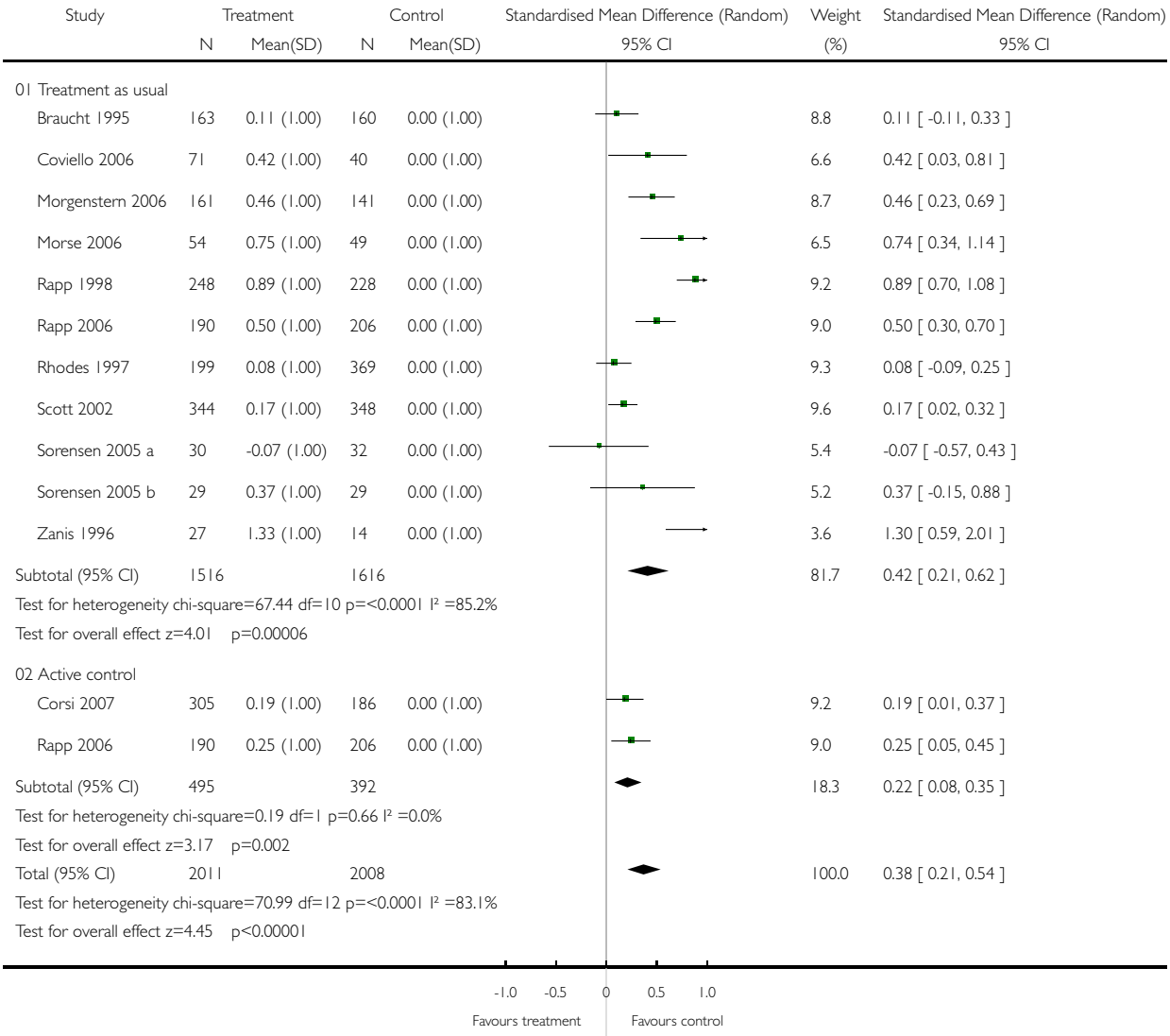


Analysis 07.02. Comparison 07 Type of control, Outcome 02 Successful linkage

Review: Case management for persons with substance use disorders

Comparison: 07 Type of control

Outcome: 02 Successful linkage



Analysis 07.03. Comparison 07 Type of control, Outcome 03 Physical health

Review: Case management for persons with substance use disorders

Comparison: 07 Type of control

Outcome: 03 Physical health

Study	Treatment N	Treatment Mean(SD)	Control N	Control Mean(SD)	Standardised Mean Difference (Random) 95% CI	Weight (%)	Standardised Mean Difference (Random) 95% CI
01 Treatment as usual							
Sorensen 2003	71	0.50 (0.33)	80	0.40 (0.33)		17.3	0.30 [-0.02, 0.62]
Subtotal (95% CI)	71		80			17.3	0.30 [-0.02, 0.62]
Test for heterogeneity: not applicable							
Test for overall effect z=1.84 p=0.07							
02 Active control							
Naber 2006 a	177	0.04 (1.00)	184	0.00 (1.00)		42.0	0.04 [-0.17, 0.25]
Naber 2006 b	169	0.10 (1.00)	181	0.00 (1.00)		40.7	0.10 [-0.11, 0.31]
Subtotal (95% CI)	346		365			82.7	0.07 [-0.08, 0.22]
Test for heterogeneity chi-square=0.16 df=1 p=0.69 I² =0.0%							
Test for overall effect z=0.92 p=0.4							
Total (95% CI)	417		445			100.0	0.11 [-0.02, 0.24]
Test for heterogeneity chi-square=1.82 df=2 p=0.40 I² =0.0%							
Test for overall effect z=1.61 p=0.1							

Analysis 08.01. Comparison 08 Low versus high Methodological Quality Scale, Outcome 01 Drug use

Review: Case management for persons with substance use disorders

Comparison: 08 Low versus high Methodological Quality Scale

Outcome: 01 Drug use

Study	Treatment N	Treatment Mean(SD)	Control N	Control Mean(SD)	Standardised Mean Difference (Random) 95% CI	Weight (%)	Standardised Mean Difference (Random) 95% CI
01 Low (MQS<10)							
Subtotal (95% CI)	0		0			0.0	Not estimable
Test for heterogeneity: not applicable							
Test for overall effect: not applicable							
02 High (MQS>=10)							
Martin 1993	56	-0.02 (1.00)	63	0.00 (1.00)		11.4	-0.02 [-0.38, 0.34]
Morgenstern 2006	135	0.58 (1.00)	156	0.00 (1.00)		17.3	0.58 [0.34, 0.81]
Rapp 1998	249	0.24 (1.00)	228	0.00 (1.00)		20.5	0.24 [0.06, 0.42]
Rhodes 1997	395	0.10 (1.00)	734	0.00 (1.00)		24.0	0.10 [-0.02, 0.22]

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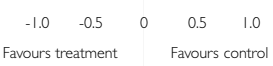
Study	Treatment N	Treatment Mean(SD)	Control N	Control Mean(SD)	Standardised Mean Difference (Random) 95% CI	Weight (%)	Standardised Mean Difference (Random) 95% CI
Sorensen 2003	28	0.03 (1.00)	29	0.00 (1.00)		7.0	0.03 [-0.49, 0.55]
Sorensen 2005 a	28	0.11 (1.00)	28	0.00 (1.00)		6.9	0.11 [-0.42, 0.63]
Sorensen 2005 b	71	1.70 (1.30)	80	1.30 (1.70)		13.0	0.26 [-0.06, 0.58]
Subtotal (95% CI)	962		1318			100.0	0.21 [0.06, 0.37]
Test for heterogeneity chi-square=14.79 df=6 p=0.02 I^2 =59.4%							
Test for overall effect z=2.65 p=0.008							
Total (95% CI)	962		1318			100.0	0.21 [0.06, 0.37]
Test for heterogeneity chi-square=14.79 df=6 p=0.02 I^2 =59.4%							
Test for overall effect z=2.65 p=0.008							



Analysis 08.02. Comparison 08 Low versus high Methodological Quality Scale, Outcome 02 Successful linkage

Review: Case management for persons with substance use disorders

Comparison: 08 Low versus high Methodological Quality Scale

Outcome: 02 Successful linkage

Study	Treatment N	Treatment Mean(SD)	Control N	Control Mean(SD)	Standardised Mean Difference (Random) 95% CI	Weight (%)	Standardised Mean Difference (Random) 95% CI
01 Low (MQS<10)							
Braucht 1995	163	0.11 (1.00)	160	0.00 (1.00)		10.5	0.11 [-0.11, 0.33]
Subtotal (95% CI)	163		160			10.5	0.11 [-0.11, 0.33]
Test for heterogeneity: not applicable							
Test for overall effect z=0.99 p=0.3							
02 High (MQS>=10)							
Coviello 2006	71	0.42 (1.00)	40	0.00 (1.00)		8.3	0.42 [0.03, 0.81]
Morgenstern 2006	161	0.46 (1.00)	141	0.00 (1.00)		10.4	0.46 [0.23, 0.69]
Morse 2006	54	0.75 (1.00)	49	0.00 (1.00)		8.2	0.74 [0.34, 1.14]
Rapp 1998	248	0.89 (1.00)	228	0.00 (1.00)		10.9	0.89 [0.70, 1.08]
Rapp 2006	190	0.50 (1.00)	206	0.00 (1.00)		10.7	0.50 [0.30, 0.70]
Rhodes 1997	199	0.08 (1.00)	369	0.00 (1.00)		11.0	0.08 [-0.09, 0.25]
Scott 2002	344	0.17 (1.00)	348	0.00 (1.00)		11.3	0.17 [0.02, 0.32]
Sorensen 2005 a	30	-0.07 (1.00)	32	0.00 (1.00)		7.0	-0.07 [-0.57, 0.43]
Sorensen 2005 b	29	0.37 (1.00)	29	0.00 (1.00)		6.7	0.37 [-0.15, 0.88]

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Study	Treatment N	Treatment Mean(SD)	Control N	Control Mean(SD)	Standardised Mean Difference (Random) 95% CI	Weight (%)	Standardised Mean Difference (Random) 95% CI
Zanis 1996	27	1.33 (1.00)	14	0.00 (1.00)		4.9	1.30 [0.59, 2.01]
Subtotal (95% CI)	1353		1456			89.5	0.45 [0.23, 0.67]
Test for heterogeneity chi-square=61.79 df=9 p=<0.0001 I² =85.4%							
Test for overall effect z=4.04 p=0.00005							
Total (95% CI)	1516		1616			100.0	0.42 [0.21, 0.62]
Test for heterogeneity chi-square=67.44 df=10 p=<0.0001 I² =85.2%							
Test for overall effect z=4.01 p=0.00006							

Analysis 09.01. Comparison 09 High versus low linkage, Outcome 01 Drug use

Review: Case management for persons with substance use disorders

Comparison: 09 High versus low linkage

Outcome: 01 Drug use

Study	Treatment N	Treatment Mean(SD)	Control N	Control Mean(SD)	Standardised Mean Difference (Random) 95% CI	Weight (%)	Standardised Mean Difference (Random) 95% CI
01 Low (d<0.4)							
Rhodes 1997	395	0.10 (1.00)	734	0.00 (1.00)		26.1	0.10 [-0.02, 0.22]
Sorensen 2005 a	28	0.11 (1.00)	28	0.00 (1.00)		7.4	0.11 [-0.42, 0.63]
Sorensen 2005 b	71	1.70 (1.30)	80	1.30 (1.70)		14.1	0.26 [-0.06, 0.58]
Subtotal (95% CI)	494		842			47.6	0.12 [0.01, 0.23]
Test for heterogeneity chi-square=0.85 df=2 p=0.66 I² =0.0%							
Test for overall effect z=2.10 p=0.04							
02 High (d>=0.4)							
Coviello 2006	71	0.10 (1.00)	40	0.00 (1.00)		11.3	0.10 [-0.29, 0.49]
Morgenstern 2006	135	0.58 (1.00)	156	0.00 (1.00)		18.8	0.58 [0.34, 0.81]
Rapp 1998	249	0.24 (1.00)	228	0.00 (1.00)		22.3	0.24 [0.06, 0.42]
Subtotal (95% CI)	455		424			52.4	0.33 [0.06, 0.59]
Test for heterogeneity chi-square=6.61 df=2 p=0.04 I² =69.7%							
Test for overall effect z=2.39 p=0.02							
Total (95% CI)	949		1266			100.0	0.24 [0.08, 0.41]
Test for heterogeneity chi-square=13.19 df=5 p=0.02 I² =62.1%							
Test for overall effect z=2.91 p=0.004