

## Review

## Strategies to improve treatment utilization for substance use disorders: A systematic review of intervention studies

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## ABSTRACT

**Background:** Many people who need specialty treatment for substance use disorders (SUDs) do not receive it. Clinical interventions could increase treatment utilization but are not routinely used. This systematic review aimed to describe clinical interventions that may increase SUD specialty treatment utilization (i.e., treatment initiation, attendance, meaningful engagement) and to determine which intervention(s) most consistently increase treatment utilization.

**Methods:** We conducted a systematic review of clinical intervention studies (published in English between 2000 and 2017) reporting outcomes relevant to specialty SUD treatment utilization. Outcomes were treatment initiation, attendance, and meaningful engagement. Risk of bias was assessed using Cochrane guidelines and randomized controlled trials (RCTs) with bias scores < 3 were included in a synthesis of results. Proportions of positive to negative utilization outcomes were calculated for each low-bias RCT; studies with 50% positive outcomes or more were considered “majority-positive”. Studies were categorized by theory-based approach.

**Results:** Twenty-three RCTs had low risk of bias and were synthesized. Among intervention types with two or more studies, cognitive-behavioral (100% majority-positive) and coordinated care (67% majority-positive) interventions were most likely to increase treatment initiation, while 12-step promotion interventions were most likely to increase treatment attendance (50% majority-positive). One study (12-step promotion) measured meaningful engagement, with majority-positive outcomes.

**Conclusions:** A systematic review and narrative synthesis of clinical interventions promoting specialty SUD treatment utilization provided preliminary evidence that cognitive-behavioral and coordinated care interventions may increase treatment initiation, while 12-step promotion interventions may promote treatment attendance. More quality studies and greater consistency in treatment utilization measurement are needed.

## 1. Introduction

In the United States, only 2.3 million (10.8%) of the 21.7 million people with substance use disorders (SUDs) received needed treatment in 2015 (Lipari et al., 2016). Although the reasons for this gap in treatment utilization are unknown, they most likely include limited access, cost, stigma, lack of patient readiness, and patient or provider misconceptions about the nature of SUD treatment. Low-cost, effective interventions to motivate, educate, and empower people with SUDs to initiate, attend, and engage in available treatments are needed.

Screening, brief intervention, and referral to treatment (SBIRT) is a widely used framework for identifying and intervening with people

who misuse alcohol and other drugs (AOD). SBIRT consists of screening for SUDs, encouraging behavior change through a brief intervention, and referring patients for SUD treatment when clinically indicated (Babor et al., 2007). Recent research has mostly focused on the efficacy of brief interventions on substance use outcomes (e.g., abstinence, reduction of use, consequences of use) (Barata et al., 2017; Beyer et al., 2018; Yuma-Guerrero et al., 2012). Referral to treatment is a critical component of the SBIRT model, yet research often neglects whether referrals to treatment have successfully prompted treatment utilization (Glass et al., 2015).

A variety of clinical interventions have shown promise in potentially improving treatment utilization. For example, starting medication-

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assisted treatment (e.g., methadone, buprenorphine (Saxon et al., 2013)) in an acute care setting may enhance retention in long-term treatment for opioid use disorders. Twelve-step facilitation (TSF) promotes attendance at mutual-help meetings (Project MATCH Research Group, 1997). Motivational approaches (e.g., Motivational Enhancement Therapy (Miller et al., 1992), motivational interviewing (Miller and Rollnick, 1991)), which focus on internal motivation for change, may increase treatment utilization by promoting readiness to change. Fourth, cognitive-behavioral therapy (CBT) for substance use focuses on building behavioral skills and cognitive coping tools, which may assist clients in building motivation, addressing stigma, and generally utilizing treatment effectively (Project MATCH Research Group, 1997). Integrated care (e.g., intensive case management, delivery of multiple services in a single location) may facilitate treatment utilization by reducing barriers to and improving access to treatment (Savic et al., 2017). Finally, contingency management (Higgins et al., 2008) can be used to systematically reinforce treatment utilization, thereby encouraging utilization variables such as attendance or meaningful engagement.

Moreover, different clinical interventions may affect different and discrete aspects of treatment utilization. For example, motivational approaches may provide an impetus for treatment initiation by assisting clients in overcoming ambivalence to seeking help. Once treatment has been initiated, contingency management strategies that reward treatment-consistent behaviors (e.g., attending treatment sessions) may increase attendance. Strategies that focus on active participation in treatment, such as TSF, may effectively target meaningful engagement. Overall, interventions may increase treatment utilization by enhancing access to treatment, providing information and education, increasing motivation, addressing stigma, and teaching essential skills such as emotion regulation (Glass et al., 2017). However, research has not yet systematically differentiated between these clinical interventions and their specific (if any) effects on treatment utilization.

The present study sought to systematically review the literature on clinical interventions that may promote utilization of SUD specialty treatment. Eligible clinical interventions included interventions specifically targeting treatment utilization and interventions primarily targeting abstinence from and/or reduction in substance use that might also have secondary effects on treatment utilization (e.g. providing MAT in acute care settings). Specific aims were to: 1) describe types of clinical interventions that may increase SUD specialty treatment utilization (i.e., treatment initiation, attendance, meaningful engagement), and 2) determine which intervention types most consistently result in SUD specialty treatment utilization.

## 2. Methods

This review adheres to guidelines outlined in the Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) statement.

### 2.1. Protocol and registration

Methods of the analysis and inclusion criteria were specified in advance and documented on PROSPERO (#CRD42018085379).

### 2.2. Inclusion criteria

We searched for clinical studies that reported the effects of an intervention on utilization of specialty SUD treatment. Included studies met the following screening criteria, evaluated in order: 1) topic included alcohol and/or other drug use in humans, excluding nicotine, 2) reported the effects of a clinical intervention on an outcome, and 3) included at least one outcome related to treatment utilization. Treatment utilization outcomes included treatment initiation (i.e., beginning treatment), attendance (i.e., sustained enrollment in

treatment), and meaningful engagement (i.e., depth of treatment participation). Treatment types included specialty SUD treatment at any level of care (e.g., inpatient, residential, outpatient), mutual-help groups (e.g., Alcoholics Anonymous), and medication-assisted treatment (e.g., buprenorphine). Study types initially eligible for inclusion included randomized controlled trials (RCTs), single cohort with a pre-post design, quasi-experimental, and non-randomized with a comparison group. However, eligibility criteria were revised to include only RCTs ( $N = 52$ ), because they provide the strongest tests of clinical interventions. Other study designs ( $N = 6$ ) are not discussed further. Included studies were published between 1/1/2000 and 8/28/2017.

### 2.3. Exclusion criteria

Studies were excluded if they were not published in English, were published before the year 2000, or did not use human subjects. Because we were interested in clinical interventions promoting use of SUD treatment, we also excluded studies that were descriptive or observational, measured only primary care or emergency treatment, or assessed policy-change or provider-level interventions.

### 2.4. Data sources and searches

Studies were identified by a keyword search of the following electronic databases: PubMed, EMBASE, Web of Science, CINAHL, PsycINFO, and Sociological Abstracts. This database search was conducted on August 28, 2017 in consultation with a research librarian (see Table S1 for search keywords).<sup>1</sup> Keywords were defined by three overarching search concepts: SBIRT, alcohol and/or drug (AOD) use, and referral to treatment (RT). First, we searched SBIRT keywords in isolation. Second, we searched for each RT keyword in combination with each AOD keyword (Table S1). The search strategy aimed to identify studies addressing referral to specialty SUD treatment, regardless of intervention type.

### 2.5. Study selection

Initial eligibility screening of abstracts was performed by the first and second authors. Abstracts that did not meet inclusion criteria were excluded. When eligibility was unclear, the full text was pulled for screening and discussed by all authors to establish consensus. The full group also reviewed a randomly selected subset (5%,  $n = 100$ ) of the abstracts that were determined to have not met criteria. The third and fourth authors reviewed and confirmed inclusion of all the accepted abstracts. Discrepancies were discussed as a full group until consensus was reached. Details of the article screening process and outcomes are in Fig. 1.

### 2.6. Data collection process

Seventy-two full-text articles were pulled for data extraction and divided equally between the first and second authors for review ( $n = 36$  articles each). The study team developed and refined a data extraction form (Appendix A) based on Cochrane guidelines. The team met regularly to review study data, discuss any uncertainties, and reach consensus.

### 2.7. Study characteristics

For each article, we recorded sample demographics (e.g., age group, special characteristics such as pregnancy or incarceration) and intervention and comparison conditions (e.g., Twelve-Step Facilitation

<sup>1</sup> Supplementary material can be found by accessing the online version of this paper at <https://doi.org/10.1016/j.drugalcdep.2020.108065>.

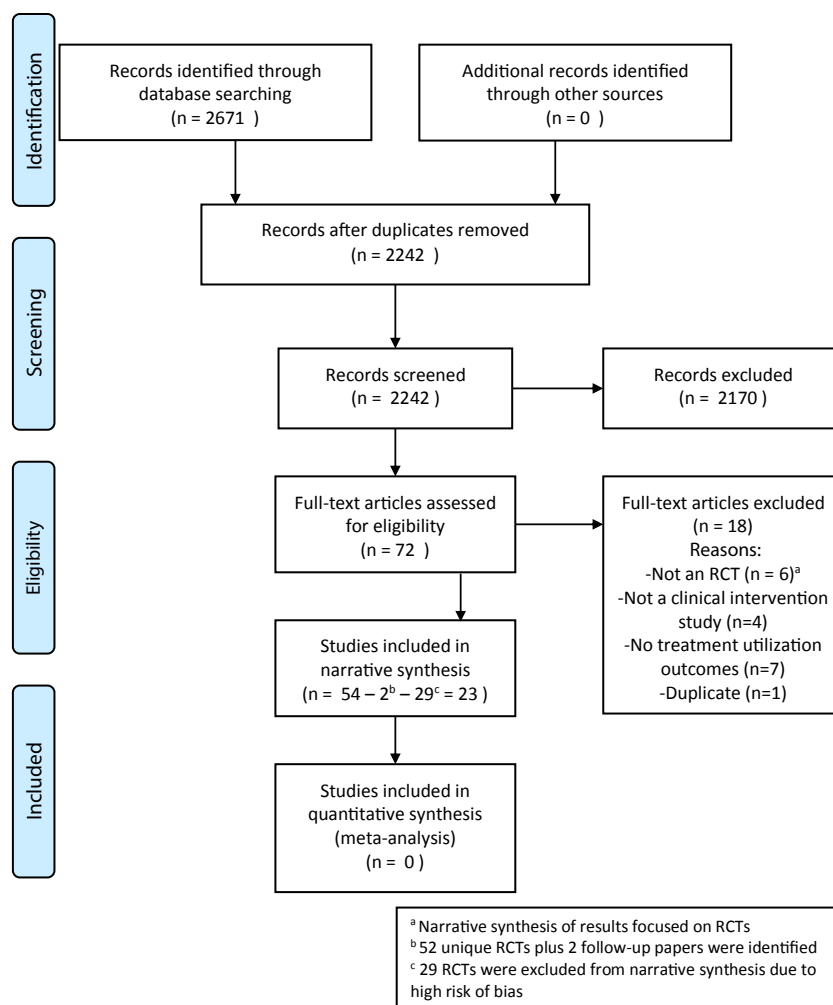


Fig. 1. PRISMA 2009 flow diagram.

[TSF], standard care). Study details for the RCTs included in the synthesis of results are presented in Table S2. Interventions were categorized based on their key features (described below).

## 2.8. Intervention outcome measures

We extracted any outcomes related to utilization of specialty SUD treatment. These included measures such as admitting to intensive treatment, days of treatment attended, and degree of meaningful engagement in 12-step programs. Some articles included multiple relevant outcomes with widely ranging definitions. Due to the heterogeneity of outcomes both within and between studies, we focused on a narrative synthesis of results assessing proportions of positive effects to negative or neutral effects within each treatment utilization domain (i.e., treatment initiation, attendance, meaningful engagement). We recorded whether there was a statistically significant intervention effect (i.e., a difference between a treatment group and comparison group) for each relevant study outcome. Then, we calculated each study's proportion of positive to negative outcomes (expressed as percentage of positive outcomes) in each treatment utilization domain. Within each treatment utilization domain, we report the number of studies of each intervention type that showed positive effects for at least half of the relevant outcomes measured (Eysenbach et al., 2004; Ramsey et al., 2020). Calculating proportions at the *study* level, rather than the *intervention type* level, allowed us to compare intervention types without placing undue weight on studies that assessed a large number of outcomes.

## 2.9. Risk of bias

Risk of bias was assessed at both the study and outcome levels using an approach informed by Cochrane guidelines (Higgins et al., 2011). Two reviewers independently assessed the level of each type of bias in each study and discussed points of uncertainty with each other and with the rest of the team when needed to come to consensus. Bias categories and criteria are presented in Table 1. Reviewers assigned a rating of 0 (low risk of bias), 1 (moderate or unclear risk of bias), or 2 (high risk of bias) to each category and summed the ratings across categories, for a possible bias score of 0–10. Studies rated 0–2 were considered low risk of bias and are included in the narrative synthesis of results.

## 3. Results

### 3.1. Study selection and characteristics

Of the 72 manuscripts extracted for full review, 54 manuscripts (52 unique RCTs plus 2 follow-up manuscripts; Appendix B) were determined to have met inclusion criteria (see Fig. 1 for full screening results). There was a great deal of heterogeneity in measurement and outcomes, with some outcomes (e.g., treatment attendance) measured multiple ways within the same study. Thirty-five RCTs (67.3%) included measures of treatment initiation, 39 (75.0%) included measures of treatment attendance, 4 (6.6%) included measures of meaningful treatment engagement, and 1 (1.9%) included measures that met screening criteria but did not fit into any of the above definitions (i.e.,

**Table 1**  
Cochrane criteria for assessing risk of bias in randomized controlled trials.

Bias category	Definition	Signs of meeting criteria
Selection bias	Systemic differences between baseline characteristics of the two groups being compared	Adequate randomization procedures, including concealment of allocation sequence
Performance bias	Systematic differences between groups in care being provided, or exposure to factors other than the intervention	Blinding of study personnel and participants to study condition
Detection bias	Systematic differences between groups in how outcomes are determined	Blinding of interviewers to study condition
Attrition bias	Systematic differences between groups in withdrawals from the study	Lack of significant differences in attrition between study conditions
Reporting bias	Systematic differences between reported and unreported findings in the publication	All relevant outcomes appear to have been reported regardless of their statistical significance

motivation and confidence for treatment involvement; labeled “other”). Treatment initiation, attendance, and meaningful engagement are defined below. Only low-bias RCTs ( $n = 23$  of 52 RCTs extracted) are included in synthesis of results.

### 3.2. Risk of Bias

Risk of bias (ranging from 0 to 6; highest possible score = 10) was assessed using Cochrane criteria for five types of bias: selection, performance, detection, attrition, and reporting (Table 1). Reasons for high risk of bias included issues such as a lack of interviewer blinding, a systematic influence of demand characteristics (e.g., one group figuring out key features of the study design and altering their behavior accordingly), and statistically significant differences in attrition rates between groups related to characteristics of the intervention (e.g., desire to be in the intervention group leading to attrition from the control group). However, bias scores were generally low ( $M = 2.67$ ,  $SD = 1.22$ ).

### 3.3. Interventions used to promote treatment utilization

Identified intervention types included: 1) medication-assisted treatment (MAT; e.g., buprenorphine initiated in the emergency department [ED]), 2) twelve-step promotion (e.g., Twelve-Step Facilitation [TSF], enhanced referrals to 12-step programs), 3) motivational approaches (e.g., Motivational Enhancement Therapy [MET], motivational interviewing [MI], miscellaneous motivational counseling), 4) coordinated care (e.g., integrated care medical settings, intensive case management), 5) cognitive-behavioral approaches (e.g., brief Cognitive Behavioral Therapy [CBT]), 6) contingency management (CM) (e.g., providing incentives for treatment participation), and 7) other. The most common intervention types were motivational approaches ( $n = 10$ ), followed by coordinated care ( $n = 5$ ) and twelve-step promotion ( $n = 4$ ). Less common were cognitive-behavioral approaches ( $n = 2$ ), MAT ( $n = 1$ ), CM ( $n = 1$ ), and other ( $n = 1$ ). Interventions were categorized based on the primary intervention strategies as identified by the study authors. For example, a study comparing an integrated care model to independent treatment as usual would be classified as coordinated care, even if the integrated care treatment included elements of other interventions (e.g., MET, CBT). This approach ensured that our conclusions aligned with the study authors' interpretations of their data. When studies included multiple intervention arms that were tested as active treatments (e.g., twelve-step promotion and motivational approaches; Blondell et al., 2011), treatment utilization outcomes were extracted for both intervention arms.

### 3.4. Measurement of treatment utilization

Examples of treatment *initiation* measures include enrolling in any treatment, attending a mutual-help meeting, contacting a treatment program, and scheduling an initial treatment session. Most studies used categorical variables to measure whether or not a participant attended

at least one treatment session or stay. Measures of treatment *attendance* included outpatient visits or 12-step meetings attended, inpatient or residential days, completion of a treatment program, and ratio of attended treatment sessions to scheduled treatment sessions. Measures of *meaningful engagement* reflected depth of participation and included twelve-step beliefs and practices and 12-step work. Most studies examined multiple outcomes with little consensus on outcome definitions across studies. Among the 23 studies included in our synthesis, there were 16 unique measures of treatment initiation, 28 of attendance, and 2 of meaningful engagement (from the same study), presented in Table S3. In accordance with previous research, results are expressed as a percentage of positive outcomes within each study and each type of outcome (Eysenbach et al., 2004; Ramsey et al., 2020). Studies reporting positive effects of an intervention on the majority (50% or more) of their initiation, attendance, or meaningful engagement measures are described as having “majority-positive” outcomes.

### 3.5. Intervention outcomes

#### 3.5.1. Treatment initiation

Seventeen low-bias RCTs measured treatment initiation. Overall, 8/17 studies (47%) found majority-positive outcomes.

One *medication-assisted treatment* study examined the effectiveness of emergency department-initiated buprenorphine (D'Onofrio et al., 2015) on subsequent treatment initiation, with majority-positive outcomes. Patients who received buprenorphine acutely were more likely to have received SUD treatment in general, but not inpatient treatment, 30 days later.

No low-bias *contingency management* intervention studies measured treatment initiation.

The three *coordinated care* studies examined the effects of intensive case management among women receiving public assistance (Morgenstern et al., 2006) and individuals in rural areas (Vaughan-Sarrazin et al., 2000), and the effects of integrated care among at-risk elderly drinkers in primary care (Lee et al., 2009). One intensive case management study and the integrated care study (Lee et al., 2009; Morgenstern et al., 2006) had majority-positive outcomes. Coordinated care increased treatment initiation rates (Lee et al., 2009; Morgenstern et al., 2006) and reduced time to receiving treatment (Lee et al., 2009). In total, 67% of studies had majority-positive outcomes.

The 4 *twelve-step promotion* studies tested the effectiveness of TSF administered during adult detoxification treatment (Blondell et al., 2011; Manning et al., 2012), adolescent outpatient SUD treatment (Kelly et al., 2017), and outpatient SUD treatment for adults with serious mental illness (Bogenschutz et al., 2014). Two (50%) of the four studies (Bogenschutz et al., 2014; Manning et al., 2012) had majority-positive outcomes. Specifically, adults in detoxification treatment receiving enhanced 12-step referrals (Manning et al., 2012) and adults in outpatient treatment receiving TSF (Bogenschutz et al., 2014) were more likely to initiate 12-step involvement. Adolescents were more likely to initiate 12-step involvement at 3-month follow-up, though this effect diminished over time (Kelly et al., 2017). TSF did not increase 12-step initiation in adults in detoxification treatment (Blondell et al.,



2011).

Seven studies evaluated *motivational approach* interventions. Interventions included MET in patients undergoing alcohol detoxification (Blondell et al., 2011) and brief motivational interventions delivered in the ED (D'Onofrio et al., 2008; Merchant et al., 2015), medical inpatient units (Saitz et al., 2007), primary care (Kim et al., 2016), and jail (Prendergast et al., 2017; Swogger et al., 2016). The only positive outcome observed was increased initiation of inpatient treatment at 90-day follow-up among adults in detoxification treatment who received MET (Blondell et al., 2011). None of the seven *motivational approach* studies (0%) found majority-positive treatment initiation effects.

The two *cognitive-behavioral* interventions included community reinforcement and family training (CRAFT), which teaches behavior change skills to concerned significant others of adults with SUDs (Meyers et al., 2002), and a brief cognitive-behavioral intervention among high-risk individuals screened for alcohol use disorder (Stecker et al., 2012). Both studies (100%) had majority-positive outcomes. CRAFT increased likelihood of treatment utilization (Meyers et al., 2002), and the brief intervention increased initiation of SUD treatment in general, but not AA involvement (Stecker et al., 2012).

The *other* intervention type study (Maisto et al., 2007), examining the effects of frequent vs. infrequent assessment of substance use and (orthogonally) comprehensive vs. brief assessment, yielded majority-positive outcomes for frequent assessment and majority-negative outcomes for comprehensive assessment.

In sum, treatment initiation outcomes were mixed for most types of interventions. The *cognitive-behavioral* and *coordinated care* interventions generally performed well, with 100% and 67% of studies having majority-positive outcomes, respectively. The one *medication-assisted treatment* study also had majority-positive effects on treatment initiation. Notably, none of the *motivational approach* interventions had majority-positive outcomes. Across intervention types, we did not find notable patterns in results by population or intervention setting.

### 3.5.2. Treatment attendance

Sixteen low-bias RCTs measured treatment attendance. Four (25%) of these studies reported majority-positive effects. Results are summarized by intervention type below.

The *medication-assisted treatment* intervention previously discussed (ED-initiated buprenorphine; D'Onofrio et al., 2015) had a non-significant effect on treatment attendance (i.e., number of outpatient visits).

One *contingency management* (CM) study evaluated the effect of three CM treatments among patients with opioid use disorder over a 6-month follow-up period (Brooner et al., 2007). When the three CM interventions were each compared to standard care, the majority of outcomes were positive. Abstinence-contingent vouchers alone did not increase treatment attendance. However, adding a motivated stepped care strategy, which reinforces treatment attendance, increased treatment session scheduling and attendance.

The four *coordinated care* interventions involved unstably housed women with alcohol use disorders treated using the chronic care model for disease management vs. usual care (Upshur et al., 2015) and primary care patients enrolled in integrated medical and substance use care vs. independent care (Weisner et al., 2001), in addition to women receiving public assistance (Morgenstern et al., 2006) and at-risk elderly drinkers in primary care (Lee et al., 2009), as described above. Intensive case management for women receiving public assistance resulted in majority-positive outcomes (Morgenstern et al., 2006). Specifically, women who received intensive case management were more likely to attend treatment sessions following initiation and more likely to complete an outpatient program than those receiving screening and referral only (Morgenstern et al., 2006). Among unstably housed women with alcohol use disorders, the chronic care model resulted in greater counseling session attendance at 3-month follow-up and more total contacts with SUD services at 3-month and 6-month follow-ups,

though the majority of outcomes measured were non-significant (Upshur et al., 2015). In sum, one of four (25%) *coordinated care* studies had majority-positive effects.

There were four *twelve-step promotion* studies, as described above. As with treatment initiation outcomes, the majority of outcomes were positive for adults in detoxification treatment receiving extensive 12-step referrals (Manning et al., 2012) and adults in outpatient treatment receiving TSF (Bogenschutz et al., 2014). Participants who received these interventions attended more 12-step meetings (Bogenschutz et al., 2014; Manning et al., 2012) and were more likely to attend a 12-step meeting (Bogenschutz et al., 2014) within a year of receiving the intervention. In total, two of four (50%) twelve-step promotion studies had positive effects on at least half of treatment attendance outcomes.

Five studies used *motivational approaches*, including the studies of adults in detoxification treatment (Blondell et al., 2011) and the emergency department (Merchant et al., 2015) described above. The three additional studies examined MET conducted in outpatient treatment in Mexico (Marín-Navarrete et al., 2017) and among pregnant women in the United States (Winhusen et al., 2008), plus a computerized MI intervention delivered to probationers (Lerch et al., 2017). MET resulted in greater likelihood of completing inpatient treatment (Blondell et al., 2011); however, none of *motivational approaches* had majority-positive effects.

One study (Stecker et al., 2012), described above, tested a *cognitive-behavioral* intervention, with 0% positive outcomes on treatment attendance (i.e., number of outpatient sessions, number of inpatient days).

The *other* intervention type study did not yield majority-positive outcomes of frequent substance use assessment or comprehensive substance use assessment on number of days in outpatient or inpatient treatment (Maisto et al., 2007).

Proportions of positive outcomes were generally lower for treatment attendance than initiation, with only five of 16 (31%) studies reporting majority-positive results. Studies with at least 50% positive outcomes were those evaluating multiple contingency management strategies for patients with opioid use disorder (Brooner et al., 2007), intensive case management for women receiving public assistance (Morgenstern et al., 2006), and two 12-step promotion studies for adults in SUD treatment (Bogenschutz et al., 2014; Manning et al., 2012). Notably, participants in these studies were already involved in treatment or social services.

### 3.5.3. Meaningful treatment engagement

One low-bias RCT, a *twelve-step promotion* study examining dually diagnosed adults with alcohol use disorder (Bogenschutz et al., 2014), measured meaningful treatment engagement with majority-positive outcomes. The intervention increased 12-step beliefs and practices, but not engagement in 12-step work.

Treatment utilization outcomes are further detailed in Table 2. Treatment utilization outcomes by intervention type and treatment setting are reported in Table S4.

## 4. Discussion

Referrals to treatment and other strategies to promote treatment utilization are important components of the SBIRT model that are often ignored, both in clinical practice and in research (Glass et al., 2015). Given relatively low rates of SUD treatment utilization, it is important to identify intervention components that increase treatment utilization. We identified 52 RCTs that examined effects of interventions on SUD treatment initiation, attendance, and/or meaningful engagement, 23 of which were considered low-bias RCTs. Due to extreme heterogeneity in both outcome measures and intervention characteristics, some intervention types contained very few eligible studies, and quantitative synthesis of results was not feasible. Nonetheless, differences emerged across intervention types.

Both of the cognitive-behavioral interventions had positive effects

**Table 2**  
Treatment initiation, attendance, and engagement outcomes from low-bias RCTs (N = 23).

Outcome	Intervention type	Study	Measure	Time points	Results	Risk of bias
Treatment initiation	Medication-assisted treatment	D'Onofrio et al. (2015)	Enrolled in and receiving formal addiction tx (yes/no)	30th day following randomization	Positive	0
			Use of IP addiction tx (yes/no)	30th day following randomization	Negative	
Coordinated care		Morgenstern et al. (2006) Lee et al. (2009) Vaughan-Sarrazin et al. (2000)	IP admission within the first 30 days, AND/OR receiving an OP service and any additional services within 14 days (yes/no)	1 month	Positive	1
			Receipt of any type of SUD tx (yes/no)	6 months after initial interview	Positive	2
			Time to receiving services	6 months after initial interview	Positive	
			Initiated IP, res, OP, aftercare, halfway house, or MAT (yes/no)	Quarter 1 (1 and 3 months after recruitment)	n.s. (comparing all 3 tx conditions to control group)	2
Twelve-step promotion		Blondell et al. (2011)	Initiated any service (yes/no)	Quarter 2 (6 months after recruitment)	n.s.	1
			Admitted for IP tx (yes/no)	Quarter 3 (8 and 10 months after recruitment)	n.s.	
			Initiated OP tx (yes/no)	Quarter 4 (12 and 15 months after recruitment)	n.s.	
			Admitted for res tx (yes/no)	30 days after discharge from detox	n.s.	
			Initiated AA involvement (yes/no)	90 days after discharge	n.s.	
			Initiated 12-step involvement (yes/no)	30 days after discharge	n.s.	
			Initiated 12-step involvement (yes/no)	90 days after discharge	n.s.	
			Initiated 12-step involvement (yes/no)	30 days after discharge	n.s.	
			Initiated 12-step involvement (yes/no)	90 days after discharge	n.s.	
			Initiated 12-step involvement (yes/no)	30 days after discharge	n.s.	
Motivational approaches		Blondell et al. (2011) (also listed above) Manning et al. (2012)	Initiated 12-step involvement (yes/no)	End of treatment (3 months)	Positive	1
			Initiated 12-step involvement (yes/no)	3 months after enrollment	Positive	1
			Initiated 12-step involvement (yes/no)	6 months after enrollment	n.s.	
			Initiated 12-step involvement (yes/no)	9 months after enrollment	n.s.	
			Initiated 12-step involvement (yes/no)	End of IP tx	Positive (when intervention groups combined and compared to control)	2
			Initiated any service (yes/no)	2–3 months after discharge from IP tx	Positive (when intervention groups combined and compared to control)	
			Admitted for IP tx (yes/no)	30 days after discharge from detox	n.s.	
			Initiated OP tx (yes/no)	90 days after discharge	Positive	
			Admitted for res tx (yes/no)	30 days after discharge	n.s.	
			Initiated AA involvement (yes/no)	90 days after discharge	n.s.	
D'Onofrio et al. (2008)		D'Onofrio et al. (2008)	Used IP services (yes/no)	12 months	n.s.	1
			Used OP services (yes/no)	12 months	n.s.	
			Receipt of alcohol assistance (yes/no) among patients with alcohol dependence	3 months after intervention	n.s.	
			Initiation of SUD tx of any type (yes/no)	6 months after enrollment	n.s. for BNI, negative for MOTIV	2
			Receipt of any tx (yes/no)	3 months after intervention	n.s.	2
			Contacted a tx program (yes/no)	3 months after intervention	n.s.	

(continued on next page)

Table 2 (continued)

Outcome	Intervention type	Study	Measure	Time points	Results	Risk of bias
Attendance	Cognitive-behavioral approaches	Prendergast et al. (2017)	Initiated IP tx (yes/no)	12 months after enrollment	n.s.	2
			Initiated OP tx (yes/no)	12 months after enrollment	n.s.	
			Initiated self-help group involvement (yes/no)	12 months after enrollment	n.s.	
			Admission to a publicly funded tx program, from records data (yes/no)	12 months after enrollment	n.s.	
	Swogger et al. (2016) Meyers et al. (2002)	Receiving any SUD tx (yes/no) Percentage of identified patients who completed a baseline assessment and scheduled a tx session	6 months after intervention	n.s.	Positive for both intervention groups (compared to control)	2
			3 months after intake	n.s.		
	Stecker et al. (2012)	Entered any type of tx (yes/no) Initiated AA involvement (yes/no) Presenting for OP tx (yes/no)	6 months after intake	n.s.	Positive	2
			12 months after intake	n.s.		
	Maisto et al. (2007)	Presenting for intensive treatment (yes/no)	18 months after intake	Positive	Unclear	2
			3 months after intervention	Positive for comprehensive assessment (frequency not analyzed)		
Medication-assisted treatment Contingency management	D'Onofrio et al. (2015) (also listed above) Broomer et al. (2007)	Number of OP visits Number of sessions scheduled Number of sessions attended	Months 1 – 6 following assessment	Positive for frequent assessment, negative for comprehensive assessment	1	
			Months 7 – 12 following assessment	Negative for frequent assessment and comprehensive assessment		
			30 <sup>th</sup> day following randomization	n.s.		
			End of 6-month intervention	Positive for MSC and MSC + CVI, n.s. for CVI		
			End of 6-month intervention	Positive for MSC and MSC + CVI, n.s. for CVI		
			3 months after intervention	Positive for MSC + CVI, n.s. for MSC and CVI		
			End of 6-month intervention	Positive for MSC and MSC + CVI, n.s. for CVI		
			3 months after intervention	Positive for MSC + CVI, n.s. for MSC and CVI		
			15 months after baseline	Positive		
			15 months after baseline	Positive		
Coordinated care	Morgenstern et al. (2006) (also listed above) Lee et al. (2009) (also listed above) Upshur et al. (2015)	Attended 2 additional tx days within 30 days of initiating tx (yes/no) Attended 2 additional tx days within 30 days of initiating tx AND attended at least 2 sessions during the third month after initiating tx (yes/no) Completion of an outpatient program (yes/no) Number of SUD tx visits attended Time in SUD tx in past 3 months (Initiation only, 2 additional services, 3+ additional services) Counseling sessions in past 3 months (1, 2, 3+) AA meetings attended in past 3 months (1, 2, 3+) Total contacts with any of the above SUD services in past 3 months (1, 2, 3+) Rate of participation in AA/NA per month Rate of attending in-network substance abuse tx visits per month Number of 12-step meetings attended Attended a 12-step meeting (yes/no)	15 months after baseline	Positive	2	
			6 months after initial interview	n.s.		
			3 months after baseline	n.s.		
			6 months after baseline	n.s.		
			3 months after baseline	n.s.		
			6 months after baseline	n.s.		
			3 months after baseline	n.s.		
			6 months after baseline	Positive		
			6 months after baseline	Positive		
			6 months after randomization	n.s.		
Twelve-step promotion	Bogenschutz et al. (2014) (also listed above)	End of tx (3 months) 12 months after beginning tx	End of tx (3 months)	Positive	1	
			12 months after beginning tx	Positive		

(continued on next page)

Table 2 (continued)

Outcome	Intervention type	Study	Measure	Time points	Results	Risk of bias
		Blondell et al. (2011) (also listed above)	Completion of IP tx program (yes/no)	90 days after discharge from detox	n.s.	1
			Completion of OP counseling (yes/no)	90 days after discharge from detox	n.s.	
			Completed any tx after discharge (yes/no)	90 days after discharge from detox	n.s.	
			Number of AA meetings attended	90 days after discharge from detox	n.s.	
		Kelly et al. (2017) (also listed above)	Number of 12-step meetings attended in the past 90 days	3 months after enrollment	n.s.	1
				6 months after enrollment		
				9 months after enrollment		
		Manning et al. (2012) (also listed above)	Number of 12-step meetings attended	End of tx	n.s.	2
				2–3 months after ending tx	Positive for both intervention groups	
	Motivational approaches	Blondell et al. (2011) (also listed above)	Completion of IP tx program (yes/no)	90 days after discharge from detox	Positive	1
			Completion of OP counseling (yes/no)	90 days after discharge from detox	n.s.	
			Completed any tx after discharge (yes/no)	90 days after discharge from detox	n.s.	
			Number of AA meetings attended	90 days after discharge from detox	n.s.	
		Marín-Navarrete et al. (2017)	Days of overall service utilization	28 days after randomization	n.s.	1
				8 weeks after randomization		
				12 weeks after randomization		
			Days of counseling service utilization	16 weeks after randomization	n.s.	
				28 days after randomization		
				8 weeks after randomization		
				12 weeks after randomization		
				16 weeks after randomization		
				3 months after intervention	n.s.	2
		Merchant et al. (2015) (also listed above)	Current tx enrollment (yes/no)	2 months after intervention	n.s.	2
		Lerch et al. (2017)	Two or more days of any tx involvement (yes/no)	6 months after intervention	n.s.	
				1 month after beginning intervention	n.s.	2
		Winhusen et al. (2008)	Ratio of attended to scheduled OP treatment hours	4 months after beginning intervention	n.s.	
			Number of weeks until tx dropout	End of intervention (1 month)	n.s.	
			Number of weeks in which at least one tx session was attended	4 months after beginning intervention	n.s.	
				3 months after intervention	Unclear	2
		Stecker et al. (2012) (also listed above)	Number of OP visits	3 months after intervention	Unclear	
			Number of IP days	Months 1–6 following assessment	n.s.	1
		Maisto et al. (2007) (also listed above)	Number of days of OP tx	Months 7–12 following assessment	n.s.	
	Cognitive-behavioral approach			Months 1–6 following assessment	Positive for frequent assessment, negative for comprehensive assessment	
	Other			Months 7–12 following assessment	n.s. for frequent assessment, negative for comprehensive assessment	

(continued on next page)



Table 2 (continued)

Outcome	Intervention type	Study	Measure	Time points	Results	Risk of bias
Engagement	Twelve-step promotion	Bogenschutz et al. (2014) (also listed above)	12-step beliefs and practices  12-step work	End of tx Final follow-up End of tx Final follow-up	Positive Positive n.s. n.s.	1

Note: "Tx" = treatment, "IP" = inpatient treatment, "OP" = outpatient treatment, "res" = residential treatment, "AA" = Alcoholics Anonymous. "n.s." = not significant.

on treatment initiation. Cognitive-behavioral interventions can include a wide range of psychoeducation, cognitive reappraisal, and skills training components that are core components in many SUD treatment programs (McHugh et al., 2010) and may work to facilitate treatment initiation by addressing beliefs that serve as barriers to treatment initiation (Stecker et al., 2012). Importantly, only two cognitive-behavioral studies met criteria for this synthesis, and further research is needed to establish the efficacy and mechanisms of cognitive-behavioral interventions in promoting treatment initiation. Coordinated care approaches, which provide supportive services or alter infrastructures to better link patients with treatment resources, also had high proportions of positive outcomes regarding treatment initiation. Systems barriers can interfere with treatment utilization (Timko et al., 2016a), and coordinated care interventions appeared to be mostly effective in addressing systems barriers and facilitating treatment initiation. Motivational techniques, such as MET, are major components of typical brief interventions (Babor et al., 2007), yet were less effective in facilitating treatment initiation. Pairing motivational approaches with pragmatic resources and specific referral assistance may increase their effectiveness (McLellan et al., 2014). Our results corroborate Glass and colleagues' findings that a referral to treatment after a brief motivational intervention will most likely be insufficient to promote treatment initiation (Glass et al., 2015).

Across intervention types, assisting patients with navigating treatment appears effective. For instance, patients who received buprenorphine in an acute care setting (D'Onofrio et al., 2015) and patients who received ongoing intensive case management or integrated care (Lee et al., 2009; Morgenstern et al., 2006) had positive treatment utilization outcomes. These interventions reached individuals through systems and settings they were already accessing, including the emergency department, public assistance, and primary care, and facilitated their SUD treatment initiation. Many patients may be best served by a comprehensive approach to facilitating treatment initiation that includes cognitive-behavioral approaches. Effective interventions included teaching behavior change skills to concerned significant others of adults with SUDs (Meyers et al., 2002) and a brief intervention for individuals with high-risk drinking (Stecker et al., 2012). Effective intervention components may be combined (i.e., cognitive-behavioral interventions in a coordinated care environment) to maximize likelihood of treatment initiation. Facilitating linkage to treatment and using cognitive-behavioral approaches to encourage and enable treatment utilization may be highly effective in promoting treatment initiation, although additional studies are needed to confirm.

Outcomes related to treatment attendance were generally less positive, which is to be expected, as treatment dropout is common (Substance Abuse and Mental Health Services Administration, 2009). Coordinated care interventions were less successful in sustaining treatment attendance than in initiating it. Twelve-step promotion studies performed best, increasing 12-step meeting attendance among adults who were already enrolled in formal SUD treatment (Bogenschutz et al., 2014; Manning et al., 2012). However, 12-step meeting attendance may be insufficient treatment for many patients, and positive outcomes on treatment attendance across all intervention types were still minimal. Interventions with majority-positive treatment attendance outcomes were heterogeneous, consisting of contingency management (Brooner et al., 2007), coordinated care (Morgenstern et al., 2006), and 12-step promotion (Bogenschutz et al., 2014; Manning et al., 2012). Participant characteristics were also heterogeneous, with interventions targeting treatment attendance among patients with opioid use disorder (Brooner et al., 2007), women receiving public assistance (Morgenstern et al., 2006), and patients in detoxification (Manning et al., 2012) and dual diagnosis outpatient (Bogenschutz et al., 2014) treatment programs. From these results, we cannot confidently describe effective interventions for treatment attendance, nor the interventions' effects on specific populations. Further research is needed to identify interventions that promote sustained

treatment attendance at all levels of care.

Very few studies measured meaningful engagement. One 12-step promotion study had a low enough bias score to warrant further consideration, and had mostly positive outcomes. However, this single result should be interpreted with caution. Measures of meaningful engagement are often highly subjective and specific to one treatment, making it difficult to compare the effectiveness of different interventions in promoting meaningful engagement (Walton et al., 2017). Moreover, although one can assume that meaningful engagement is positively correlated with SUD treatment outcomes, this remains an area of empirical inquiry.

Two results were particularly surprising. First, motivational approaches are known to promote change in substance use behaviors (DiClemente et al., 2017) and may seem likely to improve treatment utilization as well. However, very few studies have examined the effects of motivational approaches on treatment utilization (DiClemente et al., 2017). Motivational approaches typically focus on the individual's ability to change their own behavior, rather than seeking assistance or utilizing treatment (Morgenstern et al., 2012). Our results suggest that motivational approaches may be better-suited to encouraging self-change than encouraging treatment-seeking. Second, only one low-bias CM study was identified, and one of the three CM interventions it tested was not superior to standard care. Although this finding is somewhat inconsistent with the extant literature (Dutra et al., 2008; Timko et al., 2016b), it is worth noting that six CM studies were excluded from synthesis due to having higher bias scores. High bias scores were partly (but not entirely) driven by the nature of CM interventions (i.e., lack of participant blinding). Using Cochrane criteria to evaluate risk of bias may have excluded some high-quality CM studies. However, three of the six excluded studies had high bias scores even when removing detection bias scores from the calculation, indicating that other study quality issues were also a factor.

#### 4.1. Limitations

First, interpretation of results focused solely on RCTs. This strategy enabled us to evaluate risk of bias using a common metric and to focus on “gold standard” evidence around a particular treatment. However, studies using other designs can be informative. Second, the search strategy did not include keywords intended to capture treatment seeking or specific substances. Search terms did return one low-bias study that measured whether a participant contacted a treatment program (Merchant et al., 2015), which was categorized as a treatment initiation outcome. Treatment utilization is broad, and future research could incorporate additional aspects, such as treatment seeking and names of specific substances, into search strategies. Third, it is possible that differences in findings by intervention type were partly due to differences in underlying severity of the populations being treated. For example, MAT is intended to treat severe opioid use disorder (Saxon et al., 2013), while twelve-step promotion interventions encourage mutual-help meeting attendance (Project MATCH Research Group, 1997). However, most of the interventions studied measured treatment utilization at multiple levels of care. Moreover, several studies (Blondell et al., 2011; Manning et al., 2012) tested interventions like TSF among patients who were already in intensive treatment for severe SUDs. Fourth, not all study outcomes were extracted independently by two reviewers. Finally, the heterogeneity of outcome measures prevented quantitative synthesis of results. This limitation speaks to the need for consensus in measurement of treatment utilization. Study quality also varied, which could affect comparisons between intervention types. We assessed risk of bias for all RCTs that met criteria and retained only studies deemed sufficiently high-quality; however, it is important to note that bias ratings are subjective and are not necessarily comprehensive measures of study quality.

#### 4.2. Implications

There was a great deal of heterogeneity in how treatment utilization outcomes were defined and measured, which may have contributed to the mixed results and difficulty in drawing conclusions about the effectiveness. Our categorization of treatment utilization outcomes (i.e., initiation, attendance, meaningful engagement) was intended to capture various points along the continuum of treatment, from initiation to termination. Establishing consensus on measuring treatment utilization is an important next step in intervention research. Moreover, treatment utilization interventions may have different effects along the treatment utilization continuum and may need to adapt over time. For example, coordinated care seems to assist patients in initiating treatment, but other approaches (e.g., 12-step promotion) may be needed to sustain attendance and deepen meaningful engagement.

There was also wide variability in the theoretical basis and structural composition of the treatment utilization interventions. Many intervention programs bundled components from multiple theoretical perspectives. For example, sessions with a case manager (which would have been coded as coordinated care) likely included elements of motivational enhancement in addition to linking the client to other resources and structural support. Although only two studies were considered to be primarily cognitive-behavioral in nature, others may have included elements of CBT, such as self-monitoring or cognitive restructuring. Treatment utilization is likely a complex and multi-faceted concept requiring elements of motivation, behavior change, emotion regulation, and structural/resource interventions to improve access and acceptability. Few existing theoretical models have attempted to define and explain this construct. Further research is needed to guide concept definitions, valid measurement tools, and intervention development.

#### 5. Conclusions

In sum, treatment utilization is a critical but often overlooked area of research and clinical intervention, suffering from a lack of well-developed theoretical models, inconsistently defined outcomes, unvalidated measurement tools, and widely heterogeneous intervention studies, making interpretation and synthesis difficult. In the context of these limitations, this review suggests that interventions focused on coordinated care and cognitive-behavioral approaches were most effective at increasing SUD treatment initiation, while those focused on twelve-step promotion were more effective in increasing treatment attendance. However, results should be interpreted with caution due to the lack of specificity in describing intervention components, heterogeneity in outcome measures, and the limited number of quality studies for nearly all types of interventions. Further research is needed to develop and test robust models of treatment utilization to improve the efficacy of referrals to treatment and to identify precisely which intervention components are most effective in promoting treatment utilization at each step of the treatment continuum.

#### Contributors

JS and DR conceptualized the study. JS, DR, and KL designed the article search strategy and conducted the search. EV and KL screened abstracts and extracted outcomes. JS and DR reviewed a subset of abstracts. EV wrote the first draft of the manuscript. KL, DR, and JS reviewed the manuscript and contributed important intellectual content. All authors approved the final draft.

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### Declaration of Competing Interest

No conflict declared.

### Appendix A. Supplementary data

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