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Effect of patient characteristics on posttraumatic stress disorder treatment retention among veterans: A systematic review

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Abstract

To identify baseline patient characteristics (i.e., demographic and psychological factors, military background) associated with better posttraumatic stress disorder (PTSD) treatment retention among veterans, we conducted a systematic review. After an electronic database search for studies of PTSD treatment in veterans, two reviewers independently screened the literature for eligibility, abstracted study-level information, and assessed risk of bias. As most studies used multivariate models to assess multiple potential predictors of retention simultaneously, the results were described narratively. The GRADE approach, adapted for prognostic literature, was used to assess the overall quality of evidence (QoE). In total, 19 studies reported in 25 publications met the inclusion criteria ($n = 6$ good quality, $n = 9$ fair quality, $n = 4$ poor quality). Definitions of treatment completion and dropout varied, and some studies lumped different therapy approaches together. Older age and higher treatment expectations were associated with better retention (moderate QoE). In 5 of 6 studies, baseline PTSD severity was not associated with retention, and the remaining study reported an association between better retention and more severe PTSD symptoms; the presence of more co-occurring psychiatric disorders was associated with better retention (moderate QoE). QoE was low or insufficient to support conclusions for any other characteristics due to inconsistent results, imprecision, potential publication bias, possible study population overlap, study limitations, or lack of studies. More research is needed regarding the associations between modifiable factors (e.g., motivation, barriers, expectations) and retention, and consistent definitions of treatment completion and minimally adequate treatment should be adopted throughout the field.

Posttraumatic stress disorder (PTSD) is highly prevalent among U.S. veterans (Fulton et al., 2015; Hines et al., 2014). Potential negative consequences of PTSD include psychiatric comorbidity, high medical costs, poor work performance, familial discord, crime, and suicide risk (Debell et al., 2014; Reynolds et al., 2016; Schnurr et al., 2009; Taft et al., 2007; Young, 2017). Given the prevalence of the disorder and the magnitude of its consequences, all veterans with PTSD should have access to effective treatment. As longer treatment stay has been associated with better outcomes (Banducci et al., 2018), knowing which pretreatment patient characteristics are associated with treatment

retention and response could provide valuable information for clinical practice. Red flags for dropout or prompts to monitor specific patients more closely could be implemented.

A recent systematic review and meta-analysis of 26 randomized controlled trials (RCTs) of military PTSD treatment reported dropout rates ranging from 3% to 46%, with an aggregate dropout rate of 24.2% (Edwards-Stewart et al., 2021). The findings from this meta-analysis demonstrated that patients were significantly more likely to drop out of trauma-focused therapy than non–trauma-focused therapy (*RR* (relative risk) = 1.60, 95% CI [1.29, 1.99] for 12 RCTs); the review did not focus on patient characteristics. Meta-analyses not specific to the military have reported conflicting results. Imel et al. (2013) reported an average dropout rate of 18% in 42 RCTs: Retention was significantly poorer for longer or group interventions but was unrelated to trauma focus. In contrast, Lewis et al. (2020) found that trauma focus but not group format was associated with higher patient dropout in a meta-analysis of 115 RCTs. The authors reported that studies limited to veterans and active duty military personnel had higher dropout rates than studies that used samples that were not exclusive to military personnel.

We identified only one published systematic review that investigated the association between baseline patient characteristics and PTSD treatment retention in military samples (Goetter et al., 2015). The pooled overall dropout rate was 36% in 20 studies of Iraq and Afghanistan veterans in outpatient treatment (range: 5.0%−78.2%). Half of the studies were clinical trials, and half were observational. The authors' meta-analysis revealed higher dropout rates for group treatment compared with individual treatment and no significant difference between exposure-based therapy and non–exposure-based therapy. Their qualitative review found older age to be the most consistent positive correlate with retention, whereas being unemployed, single, or having a service-connected disability were correlated with dropout. The authors did not rate individual study quality or the quality of the body of evidence for each characteristic (Goetter et al., 2015). Thus, we conducted a systematic review to investigate the association between baseline patient characteristics and treatment retention, using enhanced methods and incorporating studies published after their review. We hypothesized our study would find similar results to those reported by Goetter et al. In addition, based on prior reviews on determinants of PTSD treatment response, as opposed to retention, we hypothesized that depression and anxiety (Dewar et al., 2020), alcohol and substance misuse (Jacobsen, 2001), avoidance coping (Dewar et al., 2020), previous inpatient or outpatient mental health treatment (Rief & Glombiewski, 2017),

lower treatment expectations (Price et al., 2015), combat exposure (Dewar et al., 2020), and a higher number of deployments would be associated with poorer retention. We also made a hypothesis regarding participants object relations scores, which reflect an individual's fundamental schemas for themselves and relationships, including recognizing emotions, affective tone, capacity for emotional investment in relationships, moral standards, and recognition of the positive role of social agency (Westen, 1991): We posited that lower object relations scores would be associated with lower retention due to poorer therapeutic alliance.

We included the following psychological interventions, as they are recommended by the clinical practice guidelines (CPG) formulated by the U.S. Department of Veterans Affairs (VA) and Department of Defense (DoD) for the treatment of PTSD (VA/DoD, 2017), based on evidence of effectiveness: trauma-based psychotherapy (i.e., specific cognitive behavioral therapy [CBT], cognitive processing therapy [CPT], eye movement desensitization and reprocessing [EMDR], prolonged exposure [PE]), non–trauma–focused psychotherapy (individual, manualized Stress Inoculation Training [SIT], present-centered therapy [PCT], and interpersonal psychotherapy [IPT]), and any undescribed mental health care for PTSD-diagnosed patients at VA facilities.

METHOD

We conducted a systematic review to investigate the potential association between patient characteristics and retention in treatment for military PTSD. The study protocol was registered in PROSPERO, an international register of systematic reviews. We searched the electronic databases PubMed, Embase, PsycINFO, Published International Literature on Traumatic Stress (PILOTS), the Cochrane Database of Systematic Reviews, and the Cochrane Central Register of Controlled Trials (CENTRAL for English-language studies; see Supplementary Materials for the exact search terms). We searched all articles published starting in 1980, when PTSD became an official diagnosis in the *Diagnostic and Statistical Manual of Mental Disorders*. The full texts of all identified studies of interventions for military PTSD published through 2019 were screened to determine whether relevant outcomes were reported. Studies of active duty personnel and veterans were retrieved, and combat exposure was not required for study inclusion. To ensure we were including all eligible articles, we further assessed articles listed in the reference lists of included studies as well as studies that were included in prior systematic reviews. RCTs and observational studies, including cohort, case-control, and case

series (i.e., analytic studies using statistical models to predict retention) studies, were eligible for inclusion if they included data from at least 50 participants, due to statistical power concerns.

Two reviewers independently screened the literature for inclusion. Reviewers abstracted prespecified study-level information from publications that met the inclusion criteria and assessed each included study's risk of bias; the project lead checked the data for accuracy. All studies, regardless of design, were assessed using the Quality in Prognosis Studies (QUIPS) instrument, designed specifically for studies of prognostic factors (Hayden et al., 2013). This tool covers the following domains: participation, attrition, prognostic factor measurement, confounding measurement and account, outcome measurement, statistical analysis (e.g., group differences, correlation, multiple regression, hierarchical linear model), adequate power, and author involvement in the development of the intervention (e.g., delivery technology such as a smartphone application).

Retention was reported as either a dichotomous variable (i.e., the percentage of patients who completed or dropped out of treatment) or length of treatment stay (i.e., number of days). Some VA authors defined adequate retention in psychotherapy as attending at least eight or nine sessions regardless of treatment type (e.g., PE, CBT, CPT). Definitions of dropout or early discontinuation were inconsistent, including "dropout prior to reaching treatment goals, typically longer than retention in RCTs" (Gros et al., 2018) or "attending less than two thirds of recommended appointments" (Jeffreys et al., 2014). Most studies on predictors of retention reported the results of multivariate models; because these cannot be pooled via meta-analysis, the results are described narratively.

We assessed the overall quality of evidence (QoE) using the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) approach (Balshem et al., 2011), adapted for prognostic literature (Iorio et al., 2015), and differentiated high, moderate, low, and insufficient confidence in findings. A body of evidence begins with a high-quality rating that is downgraded based on the following domains: study limitations (i.e., risk of bias), inconsistency, imprecision, indirectness, and publication bias. A large effect size raises the QoE rating.

The body of evidence is downgraded for risk of bias when the results are based primarily on studies with substantial methodological limitations; for example, if the body of evidence on a predictor consists solely of bivariate correlations that were not adjusted for potential confounders, the evidence is downgraded. The evidence is downgraded for inconsistency when individual study results conflict regarding the direction of the findings (e.g., a positive versus negative association with retention, regardless of statistical significance) or when substantial heterogeneity is detected in pooled analyses. For imprecision, the evidence is downgraded when confidence intervals (CIs) overlap conflicting conclusions, such as when meta-analysis results are not statistically significant, confidence intervals are wide, or most studies report statistically insignificant results when meta-analysis is not possible. Evidence is considered to be indirect when a study's population or outcome is not exactly representative; as we excluded studies of nonmilitary populations and included only studies that reported direct outcomes, there was no need to decrease any quality rating for indirectness. Regarding publication bias, the default position is to assume that prognosis research is seriously affected by publication bias until evidence to the contrary is found, such as multiple studies on different samples.

RESULTS

The results of the literature search are displayed in Figure 1. Electronic database searches identified 3,541 potentially relevant titles. Reference mining of systematic reviews identified an additional 14 studies. A dual review of 3,555 abstracts resulted in the exclusion of almost 78% of the identified studies; most were excluded because they did not report PTSD treatment outcomes among military populations. Full texts were retrieved for 758 publications. We excluded articles that were not published in English, did not focus on PTSD, did not include military populations, were review articles, and had fewer than 50 participants. Among the articles that did report PTSD in military personnel or veterans, we excluded articles that did not report retention, response, or remission outcomes ($n = 112$); reported these outcomes but did not assess predictors ($n = 116$); examined interventions that are not recommended in the VA/DoD CPG ($n = 115$); investigated medication only ($n = 91$); or reported predictors of treatment response or remission but not retention ($n = 23$). After these exclusions, 25 articles on patient characteristics and retention among veterans remained, as no articles that met the full inclusion criteria examined active duty military personnel.

Upon close review of the 25 articles ultimately deemed eligible for inclusion for the present review, we discovered that several studies were reported in multiple publications. For example, for the same study population, one article might have stratified outcomes by patient race, whereas another might have examined the effect of combat theater. We created one large record for each study that included data from all associated publications. In total,
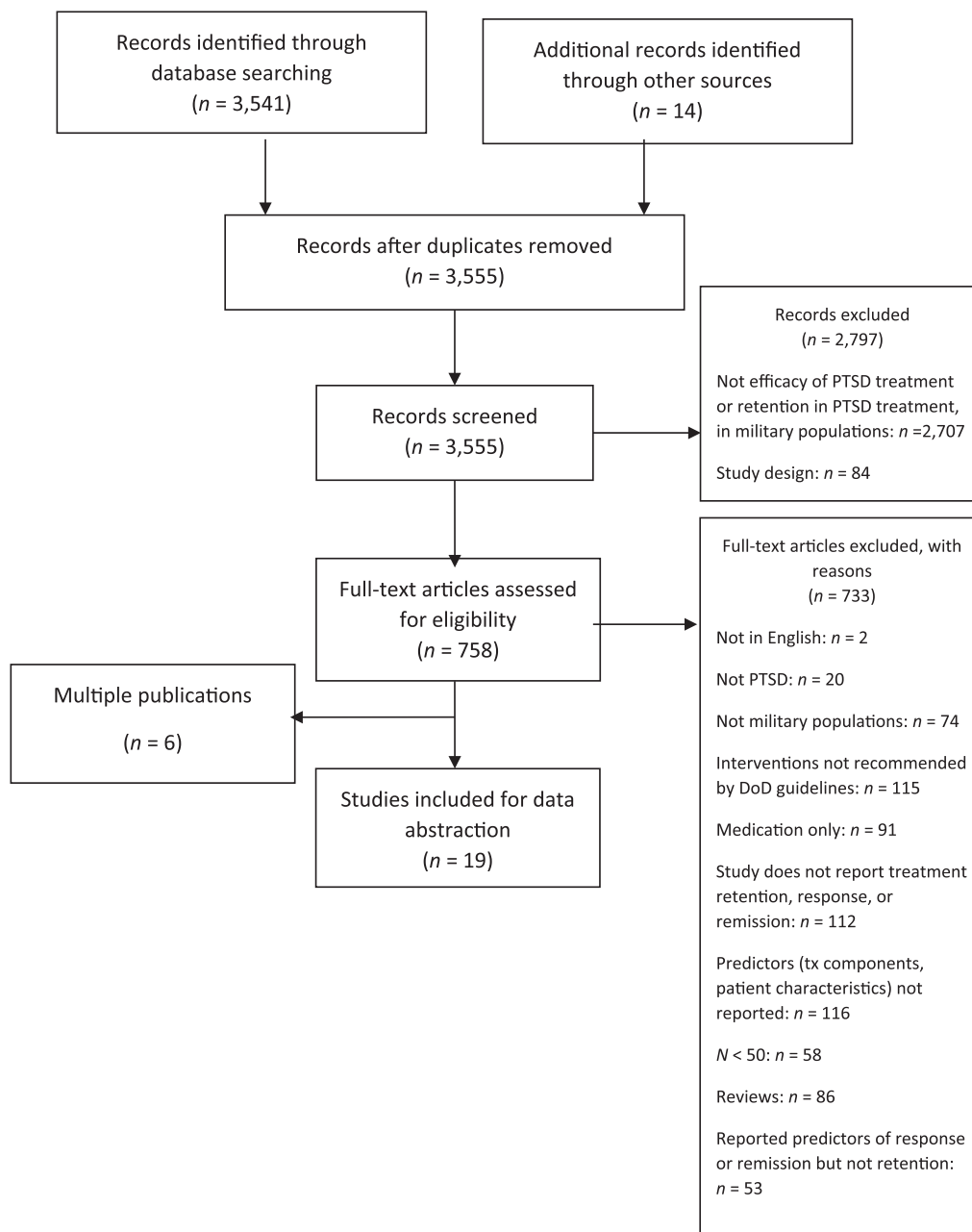
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┌─────────────────────────┐   ┌─────────────────────────┐
│ Records identified through │   │ Additional records identified │
│   database searching      │   │   through other sources    │
│      (n = 3,541)          │   │        (n = 14)           │
└─────────────────────────┘   └─────────────────────────┘
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        ┌──────────────────────────────────────────┐
        │   Records after duplicates removed        │
        │            (n = 3,555)                    │
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               ┌──────────────────────┐        ┌──────────────────────────────┐
               │  Records screened     │        │    Records excluded          │
               │   (n = 3,555)         │───────▶│      (n = 2,797)             │
               └──────────────────────┘        │                              │
                          │                     │ Not efficacy of PTSD treatment│
                          │                     │ or retention in PTSD treatment,│
                          │                     │ in military populations: n =2,707│
                          │                     │                              │
                          │                     │ Study design: n = 84         │
                          ▼                     └──────────────────────────────┘
               ┌──────────────────────┐        ┌──────────────────────────────┐
               │ Full-text articles    │        │ Full-text articles excluded, with│
               │ assessed for eligibility│─────▶│          reasons             │
               │      (n = 758)        │        │         (n = 733)            │
               └──────────────────────┘        │                              │
                   │      │                     │ Not in English: n = 2        │
                   │      │                     │ Not PTSD: n = 20             │
        ┌──────────────┐  │                     │ Not military populations: n = 74│
        │ Multiple     │◀─┤                     │ Interventions not recommended │
        │ publications │  │                     │ by DoD guidelines: n = 115   │
        │  (n = 6)     │  │                     │ Medication only: n = 91      │
        └──────────────┘  ▼                     │ Study does not report treatment│
               ┌──────────────────────┐        │ retention, response, or       │
               │ Studies included for  │        │ remission: n = 112           │
               │   data abstraction    │        │ Predictors (tx components,   │
               │      (n = 19)         │        │ patient characteristics) not │
               └──────────────────────┘        │ reported: n = 116            │
                                                │ N < 50: n = 58               │
                                                │ Reviews: n = 86              │
                                                │ Reported predictors of response│
                                                │ or remission but not retention:│
                                                │ n = 53                       │
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FIGURE 1 Literature flow diagram

19 studies reported in 25 publications are included in this review. Three were RCTs (Cook et al., 2013; Gros et al., 2013; Miles et al., 2015). The remainder were retrospective or prospective observational studies. Full details on each study, including sample size, population information, intervention type, and relevant findings, are presented in the Supplementary Materials.

We examined all 25 publications to determine quality ratings. Six studies were rated good, nine were rated fair, and four were rated poor regarding their ability to accurately determine predictors of retention (detailed quality ratings for each study are presented in the Supplementary Materials). Almost all of the included studies were conducted at VA sites or were analyses of records from the VA database. Studies involving multivariate analyses of VA data had high quality due to good statistical power and adjustment for potential confounders. However, despite abstracting reported admission dates and site locations, it was difficult to assess possible overlap between VA study populations. The QoE was downgraded for predictors if the majority of evidence came from potentially overlapping populations. Importantly, studies often combined patients

regardless of therapy approach (e.g., PE, cognitive therapy, individual and group modality).

Demographic characteristics

No demographic characteristic received a high QoE rating for predictive quality. Older age was the only predictor of better retention supported by moderate QoE: Four studies (Garcia et al., 2011; Gros et al., 2013; Hebenstreit et al., 2015; Jeffreys et al., 2014) reported a significant positive association between increasing age and treatment completion after adjusting for potential confounders, including a study of over 39,000 VA patients nationwide (Hebenstreit et al., 2015). Three other studies (Gros et al., 2018; Hernandez-Tejada et al., 2014; Spoont et al., 2015) found a positive direction of effect but statistically insignificant results using similar statistical models.

Only three studies reported on sex (Gros et al., 2013; Hernandez-Tejada et al., 2014; Mott et al., 2014). The results were mixed, so QoE was rated insufficient to formulate a conclusion. Researchers reported mixed results regarding race/ethnicity in eight multivariate analyses (Cook et al., 2013; Gros et al., 2013, 2018; Hebenstreit et al., 2015; Hernandez-Tejada et al., 2014; Mott et al., 2014; Spoont et al., 2009, 2015) and one stratified analysis (Rosenheck et al., 1995). In the stratified analysis of data from a national evaluation of the VA PTSD clinical teams program, African American patients were found to have a significantly higher risk of dropout relative to Whites ($RR = 1.15$, 95% CI [1.00, 1.33]). Hebenstreit and colleagues' (2015) analysis of over 2,000 women who served in Iraq or Afghanistan found that after adjusting for other demographic characteristics, military background, and access, African American participants were more likely than their White counterparts to complete at least eight counseling sessions (odds ratio [OR] = 1.33; 95% CI [1.13, 1.57]); the difference between Whites and Latina participants was not significant. No other studies reported a statistically significant association between race or ethnicity and retention, and, thus, QoE was insufficient to formulate conclusions.

The three studies (Gros et al., 2013; Hernandez-Tejada et al., 2014; Mott et al., 2014) that included employment status in their models had mixed findings regarding the direction of the effect, and none of these studies reported statistically significant effects (i.e., insufficient QoE). Married patients had a lower rate of treatment dropout in all four studies that included this variable in a model (Gros et al., 2013; Hebenstreit et al., 2015; Hernandez-Tejada et al., 2014; Mott et al., 2014); however, these results were not statistically significant. Thus, QoE was rated low for marital status.

Psychological factors

Six studies adjusted for baseline PTSD severity in multivariate models (Gros et al., 2013, 2018; Hebenstreit et al., 2015; Hernandez-Tejada et al., 2014; Miles et al., 2015; Spoont et al., 2015). Hebenstreit et al. (2015), found patients with PTSD severity categorized as "high" statistically more likely to complete minimally adequate care (MAC) than those with low levels of symptom severity (i.e., coefficient = 1.55, 95% CI [1.12, 2.20]) after adjusting for important patient and treatment characteristics. The other five studies reported that individuals with more severe PTSD tended to stay longer, but in no case was the association statistically significant. Two of these studies used the VA national database (Hebenstreit et al., 2015; Spoont et al., 2015), and population overlap was unclear. In addition, two studies reported bivariate correlations between baseline PTSD severity and length of stay. Badour et al. (2012) reported a statistically insignificant correlation of .05 between scores on the PTSD Checklist–Military Version (PCL-M) score and the number of days in residential treatment. Szafranski et al. (2014) studied inpatient treatment and reported conflicting results that were not statistically significant; PCL-M scores were correlated at $r = .12$ with days in treatment, whereas Clinician-Administered PTSD Scale scores had a correlation of -.11. Despite the good quality of most studies and a fairly consistent direction of association, we rated the quality of evidence for lack of association between higher baseline severity and poor retention as low due to a lack of precision and possible population overlap.

Three studies assessed the association between avoidance coping and retention. Using data on United States military veterans with PTSD, Badour et al. (2012) conducted a longitudinal study to assess the association between PTSD severity and avoidance coping ($N = 1,073$). After controlling for baseline substance use and PTSD symptom severity, the authors found that length of stay in treatment was not significantly associated with avoidance coping at intake. Cook et al. (2013) analyzed data from veterans who participated in an RCT of imagery rehearsal or sleep and nightmare management CBT ($N = 124$). A multivariate regression analysis controlling for potential confounders demonstrated that dropout rates were not predicted by avoidance symptoms. In their retrospective analysis of records of female Iraq and Afghanistan veterans enrolled in VA programs, Hebenstreit and colleagues (2015) found that patients with levels of high emotional numbing, denoted by having a high likelihood of feeling detached and having minimized interest, were less likely to complete MAC compared with participants in a class

characterized by intermediate-level symptoms, which included those with increased arousal and avoidance symptoms. We rated QoE as insufficient to support a conclusion regarding avoidance coping.

Four studies included patient depression scores in multivariate models. Three of these investigations (Gros et al., 2013, 2018; Hernandez-Tejada et al., 2014) used versions of the Beck Depression Inventory (BDI), and the fourth study (Miles et al., 2015) used the Affective Control Scale depression score. Although patients with higher depression scores tended to demonstrate poorer retention, none of these studies found a statistically significant association between these variables. Another study (Szafranski et al., 2014) reported a non–statistically significant bivariate correlation between scores on the second edition of the BDI (BDI-II) and length of stay in residential treatment (i.e., $r = .06$, $p = .62$). Garcia et al. (2011) reported that mean Minnesota Multiphasic Personality Inventory (MMPI) depression scale scores were significantly higher among patients who left treatment (i.e., cognitive therapy and/or PE) before reaching predefined treatment goals, as agreed upon by the clinician and patient, than those who remained in treatment ($p = .045$). Finally, Tuerk et al. (2011) reported that BDI-II depression scores were not associated with dropout from a PE program, but the authors did not present the statistical results. We rated the association between depression and poor retention as having a low QoE due to imprecision (i.e., lack of statistical significance) and possible publication bias.

Szafranski et al. (2014) reported a relatively large, statistically significant bivariate correlation between the number of co-occurring diagnoses and inpatient length of stay ($r = .24$, $p = .04$). Hebenstreit and colleagues (2015) found patients with two or more mental health comorbidities more likely to complete MAC than patients with no comorbidities ($OR = 3.09$, 95% CI [2.40, 4.10]) in their multivariate regression model. A moderate QoE supports the conclusion that having more co-occurring disorders is associated with better retention (i.e., large effect size and consistent statistically significant findings).

QoE was insufficient to draw conclusions on substance use disorder (SUD) due to inconsistency and study limitations. DeViva et al. (2017) found that there was no significant difference in the baseline rate of SUD between program completers and dropouts among 46 patients in evidence-based PTSD treatment programs. Similarly, Mott et al. (2014) presented stratified data comparing completers of CPT or PE with those who dropped out before completing seven sessions; the authors found no difference between completers and noncompleters in the proportion of participants diagnosed with SUD at baseline. Of note, there was a possible overlap between the samples enrolled in these two studies. Szafranski et al. (2014) included the

results of a urinary drug screen in a linear regression model predicting length of stay in an inpatient PTSD treatment program and found that after adjusting for other important patient characteristics, screening positive for illicit drugs was associated with shorter length of stay ($p < .05$).

Four studies investigated the impact of expectations or beliefs about treatment. Belsher et al. (2012) assessed expectations regarding residential treatment via a three-item index whereby participants identified their three most pressing PTSD-related problems and rated their expectation of improvement for each. A correlation analysis showed that positive treatment expectations were associated with increased length of stay ($r = 0.12$, $p = .002$). Similarly, in a multivariate regression analysis, Garcia et al. (2011) found that scores on the MMPI-2 Negative Treatment Indicators Content Scale, which measures negative attitudes toward mental health treatment, were significantly associated with outpatient treatment dropout from either PE or cognitive therapy at one VA clinic. In their RCT comparing imagery rehearsal versus sleep and nightmare management in a sample of Vietnam War veterans, Cook et al. (2013) administered the Credibility/Expectancy Questionnaire—a six-question measure designed to capture participant perceptions of treatment rationale, procedural understanding, and expectations for improvement—after the first session. Bivariate maximum-likelihood logistic regression analysis was used first on all potential predictors to limit the number of predictors used in a multivariate logistic regression analysis. In the imagery rehearsal group, lower perceived treatment credibility ($OR = 0.57$, $p < .05$) was initially associated with dropout, but statistical significance was lost in the final multivariate analysis. Spoont et al. (2015) examined whether odds of retention in VA outpatient treatment could be linked to beliefs about psychotherapy. The authors identified veterans at the beginning of an episode of PTSD treatment, oversampling women, Latino men, and members of other non-Black minority groups. Beliefs about psychotherapy were assessed using a self-administered survey created from three scales: the Beliefs About Medicines Questionnaire, the Beliefs about Psychotherapy Scale, and the Patient Attitudes Toward and Ratings of Care for Depression scale. The initial analysis included only the 6,788 veterans who initiated PTSD treatment, but the propensity models became unstable due to small numbers, so the authors ultimately analyzed the entire sample of 104,946 veterans, weighting for survey response and adjusting for nonresponse (p values were not adjusted for multiple comparisons). Using a linear regression model and propensity scoring techniques and controlling for demographic and facility factors, anticipated access barriers lowered the odds of retention in psychotherapy ($OR = 0.55$, 95% CI [0.50, 0.80], $p < .001$).

Controlling for treatment beliefs significantly decreased the odds of retention for Latino veterans but did so only moderately for African American veterans. Due to study limitations, we rated QoE regarding the association between higher treatment expectations and better retention as rated moderate. QoE was rated insufficient to draw conclusions regarding anxiety (Miles et al., 2015), anger (Miles et al., 2015), and object relations (Ford et al., 1997) because they were each investigated in only one study.

Military background

Four studies included service-connected disability status in multivariate models. Using a Cox proportional hazards model, Gros and colleagues (2018) found that veterans on disability were significantly less likely to complete eight sessions of PE ($OR = 0.36$, 95% CI [0.16, 0.88]). The same research group published the results of a hierarchical model, where disability status had a similar negative association ($p = .04$) with retention in exposure therapy in person or via telehealth (Gros et al., 2013). Tuerk et al. (2011) reported that disability rating was not associated with the completion of a PE program for PTSD, but the statistical analysis was not described. Finally, Spoont et al. (2015) found that service-connected disability was not significantly associated with the completion of eight sessions of outpatient psychotherapy ($OR = 0.90$, 95% CI [0.74, 1.09]).

Four other studies investigated the potential association between service-connected disability and retention. A small study at one VA site (DeViva et al., 2017) found that patients who received VA disability were almost twice as likely to drop out of treatment before completion compared with those who did not receive disability ($RR = 1.96$, 95% CI [1.15, 3.36]), whereas Mott et al. (2014) found a statistically insignificant relation ($RR = 1.55$, CI [0.63, 3.79]) between VA disability and dropout. Fontana and Rosenheck (1998) evaluated outcomes in veterans enrolled in inpatient ($n = 831$) and outpatient ($n = 554$) VA-based PTSD programs. Veterans were asked whether they were seeking a psychiatric service-connected disability and, if they already had one, whether they were seeking an increase in disability rating. The authors found no difference in treatment duration by disability status for inpatient ($F = 1.42$, $p > .20$) or outpatient settings ($F = .21$, $p > .60$). Finally, Belsher et al. (2012) examined the length of stay for veterans ($N = 776$) enrolled in one of five VA residential PTSD programs between 2005 and 2010; patients were classified as seeking compensation, receiving compensation, or receiving compensation and requesting an increase. Patients who were already receiving compen-

sation but not requesting an increase had significantly shorter stays (45.0 days) than those who were seeking compensation (52.9 days) or seeking an increase (48.6 days). These eight studies show fairly consistent results regarding patients on disability displaying poorer retention, although the findings were not always statistically significant. The low QoE assigned for the negative associations between service-connected disability and retention was based on imprecision (i.e., lack of statistical significance) and possible publication bias.

Using multivariate models to predict treatment completion and dropout, five studies assessed the potential effect of service area or combat theater (i.e., serving in Iraq or Afghanistan vs. another theater; Gros et al., 2018; Hernandez-Tejada et al., 2014; Jeffreys et al., 2014; Mott et al., 2014; Spoont et al., 2015). Mott et al. (2014) found that participants who served in support of operations in Iraq or Afghanistan were far less likely to complete a VA PE or CPT program ($OR = 0.09$, 95% CI [0.03, 0.30]) than those who served in other service eras. The other four studies found nonsignificant and inconsistent effects on treatment completion (Gros et al., 2018; Hernandez-Tejada et al., 2014; Jeffreys et al., 2014; Spoont et al., 2015). Thus, QoE was rated as insufficient to draw a conclusion.

Combat exposure was included as a variable in two studies. One study reported a higher rate of dropout for combat-exposed patients (Gros et al., 2013), but this variable was not significant in multivariate analyses. The authors of the other study found no significant association in a bivariate analysis, but no data on direction or effect size was reported (Cook et al., 2013). The QoE was deemed to be insufficient to support a conclusion.

The QoE for the potential effect of exposure to civilian trauma (Cook et al., 2013), participation in atrocities (Fontana et al., 2003), military rank (Szafranski et al., 2014), and number of deployments (Szafranski et al., 2014) was also rated as insufficient because each was included as a potential predictor in only one study. No statistically significant effects were identified in any multivariate analyses.

DISCUSSION

After a thorough search and comprehensive literature screening procedure, we identified 19 studies in 25 publications that assessed the potential associations between baseline patient characteristics and PTSD treatment retention among veterans. QoE was deemed to be low or insufficient for most potential predictors due to inconsistent findings, imprecision, potential publication bias, and study limitations or risk of bias. We did not rate any predictors of retention as having high QoE.

Moderate-quality evidence supports an association between increasing age and treatment retention. Perkins et al. (2016) reported a similar finding in an evidence map on addiction treatment and noted that incorporating technology into treatment has demonstrated success with retention among younger patients. In this regard, three studies in our review compared telehealth to in-person therapy: Two reported no association between telehealth and retention (Gros et al., 2013; Hernandez-Tejada et al., 2014), whereas the third reported increased retention with in-person treatment (Acierno et al., 2017). Although these studies did not assess the interaction between modality and age, the results support future examinations of the potential for technology to extend reach between treatment sessions (e.g., reminders, check-ins, follow-up) to improve retention in young veterans.

We also identified evidence that patients with service-connected disabilities are less likely to complete treatment compared with others. The results of an RCT that included a sample of mostly female patients with opioid use disorder demonstrated a highly beneficial effect of financial incentives on attendance at PE sessions (Schacht et al., 2017); we suggest trying such incentives for individuals with service-connected disabilities. Pairing a PE patient with a "buddy" who has successfully completed treatment is currently being studied as a way to improve retention (Hernandez-Tejada et al., 2020), as is promoting family involvement (Meis et al., 2019).

Surprisingly, higher levels of PTSD symptom severity at baseline were not associated with poorer retention. Moreover, a higher number of mental health comorbidities was associated with better retention. Although these findings may seem counterintuitive, patients with more severe conditions may receive stronger encouragement or more incentive to remain in treatment.

Although their comment is not limited to veterans or PTSD treatment, Cooper et al. (2018) remarked upon the plethora of studies focused on relatively immutable demographic and diagnostic characteristics compared with the dearth of studies on mechanisms or modifiable factors as predictors of retention in psychotherapy. The current review found many studies that assessed the effect of demographic characteristics and/or baseline psychological measures but far fewer studies on modifiable factors. We did identify four studies of treatment expectations that reported consistent positive associations across residential and outpatient therapy, with moderate QoE. Although these studies used different means to assess expectations, additional studies that use consistent, validated measures could increase the QoE and support a role for expectation-setting.

A major strength of the present review is that to avoid missing relevant studies, we retrieved and reviewed all 758

identified studies of treatment of PTSD in active duty military personnel and veterans. This is important for several reasons. The primary goal of some included studies was to assess program efficacy or effectiveness; retention rates were not mentioned in the study abstract. In other studies, because patient characteristics associated with outcomes were not the primary focus, they were not reported in the abstract. It was only through reviewing entire publications that these findings were discovered. A resulting limitation is that the included studies might not have been powered to detect predictors of retention, as noted by some study authors (e.g., Miles et al., 2015; Gros et al., 2013). We considered this in our QoE ratings. Fifteen studies did not report a power analysis; however, most were very large observational studies of patient records that likely were more than adequately powered.

Still, only six studies were rated as being of good quality according to the QUIPS instrument, which focuses on a study's ability to accurately detect predictors. The quality and risk of bias for each included study were assessed based on publicly available information. We reviewed all identified journal articles corresponding to each included study and checked the clinicaltrials.gov database for any missing information on methods. However, due to resource limitations, we did not contact authors with questions on methodology.

Definitions of treatment completion varied across studies. Although many VA studies used a consistent definition of retention as completing minimal adequate care (i.e., at least eight or nine sessions of psychotherapy), regardless of treatment type, other studies of VA programs used slightly different definitions of dropout, such as not completing two thirds of the 10−15 PE sessions that could be recommended (Jeffreys et al., 2014). One study used different definitions in separate publications: Acierno et al. (2017) defined dropout as attending fewer than six sessions of PE, whereas Gros et al. (2018) defined dropout as attending fewer than eight sessions. We used the definition from the Gros et al. (2018) study, as it was closer to the more common definition and considered many potential predictors.

Unfortunately, we could draw no conclusions regarding the interaction between treatment approach and baseline patient characteristics, as many studies lumped all "psychotherapy" or "counseling" together. We encourage future research regarding approach and modality.

Anger, anxiety, treatment history (DeViva et al., 2017), object relations (Ford et al., 1997), exposure to atrocities or civilian trauma, and number of deployments were assessed as potential predictors of retention in only one study each, so no conclusions could be drawn regarding these variables. Further research on the influence of these factors is recommended. Surprisingly, no studies of the potential

association between alcohol use patterns or alcohol use disorder and retention were identified; this area also warrants attention.

Despite the differences in definitions of retention and other limitations, the present findings shed important light on potential predictors of PTSD treatment retention in veterans and identify important research gaps. Standard definitions of treatment completion and minimally adequate retention in various treatment modalities should be adopted across the field. Future RCTs should strive to ascertain specific reasons for dropout and compare baseline characteristics of treatment dropouts with treatment completers. Future observational studies should examine modifiable factors, such as expectations, motivation, and barriers to treatment, while ensuring that analyses adjust for demographic characteristics, psychological variables, and treatment approach.

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