

REVIEWS



Clinical Complexity in Women Veterans: A Systematic Review of the Recent Evidence on Mental Health and Physical Health Comorbidities

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ABSTRACT

A recent evidence map focused on women veterans underscored the limited number of articles published on mental health comorbid with physical health conditions in this population. The quality of this small body of research has yet to be evaluated. The aim of this systematic review was to evaluate and synthesize research published between 2008 and 2015 and identified in the Women Veterans' Health Research Evidence Map as related to mental and physical health comorbidities among women veterans. Following PRISMA guidelines, 23 published studies were identified and 21 were included in the review. In general, significant associations between several mental health conditions (e.g., depression, posttraumatic stress disorder, substance use disorders) and physical health disorders (e.g., cardiovascular disease, diabetes, gastrointestinal disorders, hypertension, obesity, pain, and urinary symptoms) and health behaviors (e.g., preventative care and treatment adherence) were noted. The majority of studies were rated as low risk of bias, with selection and detection bias most frequently observed across studies. Additionally, gaps in the recent literature were observed, including the need for further investigation of the role of medical conditions in complicating mental health symptoms and care provision. Results underscore the importance of healthcare providers attending to women veterans' mental and physical health simultaneously and irrespective of setting. Further, while the Department of Veterans Affairs continues to make sizable gains in its focus on women veterans' health, continued research on several health domains is needed to ensure adequate understanding of the health needs of women veterans.

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Introduction

Women veterans represent the fastest growing demographic of new users of Department of Veterans Affairs (VA) healthcare.^{1,2} Women veterans report high levels of exposure to lifetime and military interpersonal trauma, including physical and sexual childhood abuse, sexual assault, and intimate partner violence.^{3–6} Women are also enrolling in VA at younger ages than ever before.^{1,7} Those women with more recent military service may also experience combat at levels only slightly lower than those of men.⁸ Women veterans' lifetime experiences of trauma combined with their status as a statistical minority within

the military and VA underscores the importance of access to high-quality, gender-sensitive, trauma-informed care. VA policy requires that gender-sensitive comprehensive primary care be available to all women veterans.^{9,10}

Such comprehensive care must address the clinical complexity that arises from comorbid mental health and physical health conditions. Clinical complexity impacts healthcare outcomes, adherence, costs, and coordination of care. For example, health outcomes are lower for patients with comorbid mental health and physical health conditions, than patients with *just* one mental health *or* physical health condition

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alone.^{11–13} Additionally, attempts to treat each disorder separately rather than take into account the unique needs of patients with clinical complexity, may result in contraindicated and unsustainable treatment regimens.¹⁴ When providers attempt to treat each disorder separately, mental health symptoms may be overlooked which can contribute to an exacerbation of mental health symptoms. The odds of noncompliance with medical treatment recommendations increase in patients with mental illness, complicating management of chronic medical conditions.¹⁵ For example, among women veterans, for whom depression appears to be more common than in men, depression is associated with poorer adherence to hypertension medications, breast cancer screening, and diabetes medications.^{16–20} Similarly PTSD is associated with more medical conditions and poorer health related quality of life in women veterans.²¹ Clinical complexity is also associated with increased healthcare costs, including preventable costs, compared to healthcare for patients without clinical complexity.¹³

The VA Evidence-Based Synthesis Program recently constructed an evidence map of the literature on women veterans' health and healthcare published between 2008 and 2015 to identify common healthcare topics, as well as notable gaps, in this body of research.²² The evidence map identified *clinical complexity in women veterans*, i.e., mental health comorbid with nonmental health, as a topic with both increased research interest and outstanding gaps in the literature.¹⁶ Prior research suggests that clinical complexity is a particular concern for women veterans – a population also vulnerable to gaps in care and fragmented care.²³

However, to date, research on physical and mental health conditions of women veterans has typically been conducted in silos, sidelining the unique issues that arise for women with comorbid concerns. Moreover, despite recent findings suggesting mental and physical health comorbidity warrant additional attention among women veterans, the systematic evidence mapping review by Danan and colleagues did not provide a synthesis of the literature, nor an analysis of the quality of the literature.²² Doing so is essential for understanding the need for subsequent research in this area. In addition, synthesizing and evaluating the literature on clinical complexity offers an important means of conveying information to both VA and non-VA healthcare providers who serve women veterans. It is important for all healthcare providers to understand the specific issues that arise

when patients are suffering from *both* medical and mental health conditions in order to provide optimal care. This is particularly important considering research demonstrating that gender-sensitive, comprehensive care results in better outcomes for women veterans (See deKleijn et al. for a review).²⁴ In addition, as greater numbers of women veterans receive care through the Mission Act of 2018, which provides additional options for veterans to receive health care from non-VA providers in the community, who may be unaware of common comorbidities in the women veteran population, a systematic review of the literature is particularly timely.^{25,26}

As such, the present systematic review aimed to evaluate and synthesize results from studies published from 2008 to 2015 on mental and physical health comorbidity among women veterans, with the goal of improving clinical care for this population. We reviewed the 23 observational studies identified by Danan and colleagues in the *mental health comorbid with nonmental health* topic area of the evidence mapping review, and completed an analysis of risk of bias across studies.²² The variety of physical and mental health conditions included in this literature precluded a meta-analytic approach to synthesizing this literature; therefore, we present our results as a narrative systematic review.

Methods

The VA Evidence-based Synthesis Program identified 23 articles related to clinical complexity in a mapping review project titled, *An Evidence Map of the Women Veterans' Health Research Literature (2008 – 2015)*.²⁷ The process for article selection and criteria for inclusion for that project have been described in detail previously.^{22,27} In brief, several databases were searched for articles published between January 2008 and December 2015, using Medical Subject Heading (MeSH) terms: *Women; Women's Health; Women's Health Services; Veterans; Veterans Health; and Hospitals, Veterans*. The main inclusion criteria required empirical studies focused on health or healthcare for US women veterans (see Danan et al. for additional information regarding article selection).²² The abstraction process resulted in 440 eligible articles. With guidance from central stakeholders in the clinical and research offices of Women's Health at VA articles were categorized into 39 healthcare topics, grouped into four main subheadings of interest: (1) mental health, (2) physical health, (3) health organization and delivery, and (4) access, utilization and

Table 1. Critical findings on clinical complexity in women veterans.

Diabetes, Cardiovascular Disease, Obesity Authors	Design	Sample	Medical Condition	MH Condition	Trauma Exposure	Result	Risk of Bias
Banerjee et al., 2009	Cross-sectional/ descriptive study, chart review only	16,368 women veterans using VA healthcare, diagnosed with diabetes	Diabetes, and diabetes- related complications (macrovascular complications, microvascular conditions, metabolic decompensation) by ICD-9 codes in VA medical record	MH divided into: 1) Other Mental illness (anxiety, PTSD, and other disorders), and 2) Serious Mental Illness (schizophrenia, bipolar disorder, psychosis, major depression), and gave a distinction for SUD (SUD; with/without) by ICD-9- CM codes in VA medical record	N/A	Women with macrovascular complications of diabetes were more likely to be in all mental illness groups compared to women with other types of medical complications; women with metabolic decompensation were more likely to be in the severe mental illness group than those without BPD and depression	Low; valid and reliable methods used
Cheney et al., 2014	Cross-sectional/ descriptive study	948 women veterans using VA healthcare	Obesity indexed by BMI, calculated via standard formula using self-report of weight and height	MH conditions (BPD, depression, anxiety, bipolar disorder, agoraphobia, panic disorder, SUD, PTSD) by self-report of prior diagnoses; structured interviews for current PTSD (PSS-I), depression (CIDI-SF), and SUD (Substance Use Outcomes Module)	Lifetime sexual assault (LSA) assessed for childhood, premilitary adulthood, MST, and postmilitary adulthood; MST assessed with the VA's 2-Item MST Screener	BPD and depression mediated the relationship between LSA and BMI; LSA was significantly associated with BPD and depression; current SUD was not a mediator of LSA and BMI	Low; Detection bias: used valid and reliable measures, except BPD was measured by self-report of past diagnosis rather than diagnostic criteria, reducing reliability
Authors Sambamoorthi et al., 2010	Design Cohort study, retrospective/ chart review only	Sample 8,147 women veterans using VA healthcare, diagnosed with coronary artery disease, hypertension, or diabetes, and depression	Medical Condition Diabetes, coronary artery disease, or hypertension based on algorithm including diagnosis in VA medical record, number of clinical care encounters, site of care, and level of care	MH Condition Depression by algorithm including diagnoses in VA medical record and an "incident episode" of depression during FY 2003; depression treatment defined as antidepressant (at least one prescription on or after start date of incident episode) or psychotherapy (therapy codes) within 180 days of first day of the incident episode	Trauma Exposure N/A	Result Among women with diabetes, CAD, or hypertension, 54% received antidepressants only, 23% received psychotherapy with or without medication, and 23% received no depression treatment; women with CAD more likely to receive no depression treatment than those with hypertension, but equally likely to receive psychotherapy (with or without medications)	Risk of Bias Low; valid and reliable methods used
Shen et al., 2010	Cross-sectional/ descriptive study, chart review only	13,430 women veterans using VA healthcare, diagnosed with diabetes, heart disease, or hypertension, and depression	Diabetes, heart disease, or hypertension by ICD-9 codes in VA and Medicare claims files	Depression by ICD-9 codes in VA medical record; divided into 3 groups, (1) MDD; (2) minor depression (depression not elsewhere specified);	N/A	Women with diabetes only or diabetes with hypertension had higher rates of MDD compared to those with hypertension only; rates of depression were	Low; valid and reliable methods used

(Continued)

Table 1. Continued.

Diabetes, Cardiovascular Disease, Obesity Authors	Design	Sample	Medical Condition	MH Condition	Trauma Exposure	Result	Risk of Bias
Chronic Neurological and Musculoskeletal Pain Haskell et al., 2008	Cross-sectional/ descriptive study	Sample 213 women veterans using VA women's health	Medical Condition Self-reported pain in last 3 months assessed with a dichotomous item; pain intensity assessed with a continuous measure; pain interference assessed with the West Haven-Yale Multidimensional Pain Inventory	MH Condition N/A, not the explicit focus, although included depressive symptom severity and alcohol use as covariates; depression assessed with CIDI and self-report of history of depression diagnosis; alcohol use assessed with AUDIT-3	Trauma Exposure Lifetime sexual trauma assessed with single dichotomous item; MST assessed with the VA MST Screener; intimate partner violence assessed with single item on physical IPV; combat trauma assessed with single item	Result Persisting pain presence was not associated with reported lifetime sexual trauma, but was associated with having two and three or more chronic conditions, and depressive symptoms; lifetime sexual trauma was associated with greater pain intensity, pain interference, and depressive symptoms PTSD, with or without MDD, was associated with increased odds of reporting back pain, muscle pain, headaches, and all three pain complaints; veterans with comorbid PTSD/MDD were also more likely to report pain complaints than veterans with PTSD or MDD alone	Risk of Bias Moderate; Detection bias: not all measures had sound psychometric properties; measurement of sexual trauma was not consistent (included military sexual harassment and lifetime sexual assault, but not nonmilitary sexual harassment) Low; Detection bias: measures appeared psychometrically valid, psychometric properties of pain outcome measure not reported and pain analyzed as a categorical variable; Confounding bias: although some confounds were included, several medical diagnoses associated with pain were not included, yet the authors noted this as a limitation of their findings and couched results within this limitation Risk of Bias Moderate; Selection bias: recruitment and sampling method differed for men and women; Detection bias: not all measures psychometrically valid (e.g., use of single-item measures), the measure of PTSD symptoms was specific to combat exposure, precluding the ability to discern if PTSD
Runnals et al., 2008	Cross-sectional/ descriptive study	1,614 OEF/OIF veterans; gender breakdown of sample not reported	Self-reported pain (including back, muscle, and/or headache pain) assessed with the National Vietnam veterans Readjustment Study Self-reported Medical Questionnaire	PTSD and MDD diagnoses determined by SCID-I-V clinical interview	Number of lifetime traumas assessed with the Traumatic Life Events Questionnaire		
Seng et al., 2013	Cross-sectional/ descriptive study	Sample 551 OEF/OIF veterans (323 women, 228 men) using VA healthcare, with clinically significant headaches	Medical Condition Headaches indexed by use of prescription headache medication in the past year	MH Condition Depression measured by PHQ-9; Panic symptoms measured by Brief Patient Health Questionnaires; PTSD measured with PCL-M	Trauma Exposure Lifetime trauma assessed with Traumatic Life Events Questionnaire; combat trauma assessed with Combat Exposure Scale; MST assessed with VA MST Screener	Result 29.1% of women took headache medication; for women, poorer perceived MH was not associated with taking headache medication; panic symptoms were associated with taking headache medication; depressive symptoms were not associated with taking headache	

medication; higher number of lifetime traumatic events associated with taking headache medication, yet combat-related traumatic events were not

symptoms were attributable to other traumatic events, may be particularly problematic for women; Confounding bias: some covariates included, but important covariates (e.g., TBI) not assessed

Authors	Design	Sample	Medical Condition	MH Condition	Trauma Exposure	Result	Risk of Bias
Maguen et al., 2014	Cohort study, retrospective/chart review only	603,221 OIF/OEF veterans (72,504 women, 530,717 men) using VA healthcare	IBS, GERD/reflex esophagitis, dyspepsia, and abdominal pain by ICD-9 codes in VA medical record	PTSD, depression, and GAD diagnoses, per ICD-9 codes in VA medical record	N/A	Prevalence of GID was 19.5%; among women, increased risk of all GIDs was greatest among those with depression; in the full sample, IBS and GID were mostly strongly associated with MH conditions	Low; valid and reliable methods used
Savas et al., 2009	Cross-sectional/descriptive study	248 women veterans using VA primary care	IBS and dyspepsia by self-reported history of diagnosis or clinically significant symptoms in previous year; IBS and dyspepsia symptoms assessed with the BDQ	PTSD assessed with the Mississippi Scale for Combat-Related PTSD Questionnaire; Depression assessed with the BDI-II; Anxiety assessed with the BAI	N/A	38% reported IBS and 21% dyspepsia; women with IBS or dyspepsia reported greater PTSD, depression, and anxiety; only anxiety was associated with IBS and dyspepsia in models adjusted for age and ethnicity	Low; valid and reliable methods used; sensitivity analysis wherein compared participants to nonparticipants on the prevalence of IBS or dyspepsia found no significant differences
White et al., 2010	Cross-sectional/descriptive study	337 women veterans using VA primary care	IBS symptoms during the last year assessed with BDQ	PTSD assessed with the Mississippi Scale for Combat-Related PTSD; Depression assessed with BDI-II	Trauma history assessed with Trauma History Questionnaire for full sample; last 25% of sample also completed Trauma Questionnaire to assess timing of interpersonal traumas	IBS prevalence was 33.5%; 6 of 18 traumas were associated with increased IBS risk, adjusting for age, ethnicity, PTSD and depression; depression and PTSD were more common among women with IBS symptoms than those without, but neither fully explained the association between trauma and increased IBS risk	Low; valid and reliable methods used; conducted a sensitivity analysis by review of medical records for a random sample of women veterans who declined to participate for differences in IBS compared to participants and did not find differences
Bradley, Nygaard, et al., 2012	Cross-sectional/descriptive study	968 women veterans using VA healthcare	Medical Condition UI including stress UI, urgency UI, and other UI, assessed with "three standardized epidemiologic items previously used in other large epidemiologic studies" (p. 2), for	Depression assessed with CIDI-SF; PTSD symptoms assessed with PSS-I	Trauma Exposure PSS-I and additional items on combat; lifetime sexual trauma assessed with 5 items adapted from the National Violence Against Women Survey	There was an association between urgency/mixed UI and PTSD, but not depression; sexual trauma was associated with UI	Low; Detection bias: a small group of women reported urgency UI only (34) and the authors combined the urgency only group with women reporting urgency and stress UI, to create a "mixed UI" group, and

(Continued)

Table 1. Continued.

Diabetes, Cardiovascular Disease, Obesity Authors	Design	Sample	Medical Condition	MH Condition	Trauma Exposure	Result	Risk of Bias
Bradley et al., 2014	Cross-sectional/ descriptive study	Sample 1,702 OEF/OIF women veterans, combination of women veterans using VA health care and not using VA health care	Medical Condition OAB defined as current symptoms that were at least mildly bothersome; assessed with the UDI for frequency and bother; IQ- 7 for functional impact	MH Condition Depression measured with the PHQ-8; Anxiety measured with GAD-7; PTSD measured with PCL-C	Trauma Exposure Lifetime sexual trauma assessed with items from past national studies on sexual violence; combat trauma assessed with items similar to the DOD Post-Deployment Health Assessment	Result OAB symptoms were elevated in this sample (22% reported bothersome symptoms) and associated with depression, anxiety, PTSD, and lifetime sexual trauma	Risk of Bias excluded women reporting minimal UI symptoms (i.e., symptoms only occurring a few times per year, 245 women, 25.3% of sample), which likely reduced variability and might have masked associations between stress UI and MH symptoms Risk of Bias Low; valid and reliable methods used; compared participants and nonparticipants on background characteristics
Klausner et al., 2009	Cross-sectional/ descriptive study	1,298 women veterans using VA primary care, 450 then referred to a specialty clinic for LUTS	LUTS assessed with UDI-6 for type and severity, and IQ- 7 for impact on quality of life	Psychiatric comorbidities by diagnoses in the VA medical record, and by reviewing all MH visit notes in the record (Klausner, A. P., personal communication, June 6, 2018)	Lifetime sexual trauma assessed with single- item measure on "sex against your will?" (pg. 2786)	Women with LUTS reported higher rates of psychiatric comorbidities and lifetime sexual trauma respectively than women without LUTS, even when taking into account potential covariates of psychiatric comorbidities and sexual trauma including age, race, and obstetric factors	Low; valid and reliable methods generally used; initially assessment of psychiatric comorbidities was unclear, but communication with the first author confirmed assessment via diagnoses in the VA medical record and reviewing MH visit notes (Klausner, A. P., personal communication, June 6, 2018)
Deployment Authors Duffy et al., 2015	Design Cross-sectional/ descriptive study	Sample 70 women veterans	Medical Condition Toxoplasma gondii titers obtained via blood samples (titer of 20 IU or greater considered positive); all samples (positive and negative) were tested for IgM antibodies to T. gondii by enzyme linked immunosorbent assay	MH Condition PTSD with PCL-M; Depression with CID; Dysphoric mood with Profile of Mood States	Trauma Exposure N/A	Result Infectivity rate for T. gondii was lower than the rate in the United States (8 out of 70 were seropositive; 11.4%), but 6 of the 8 (75%) had been deployed outside the United States; T. gondii diagnosis was associated with depression and dysphoric mood	Risk of Bias Moderate; Selection Bias: recruitment varied across groups as most women were recruited from a specific women veteran event and others were recruited via personal contacts and emails; Confounding: unable to complete multivariate analyses or adjust for confounders due to the small number of women

who screened positive ($n = 8$)
Low; Selective outcome reporting; no important outcomes missing but failed to account for the impact of MST or other traumas since return from deployment, yet a previous study on the women veterans in this sample reported sexual trauma was related to PSS symptoms and physical health (Smith et al., 2011)

Worse physical health at postdeployment than predeployment; women reported more genitourinary, musculoskeletal, and neurological symptoms than men; PTSD mediated relationship between warzone exposure and all seven types of physical health, and no sex differences; mediation models stronger for participants with low warzone exposure compared to those with high warzone exposure

Warzone exposure assessed with the Combat Experiences Scale and the Aftermath of Battle Scale of the DRR1

PTSD assessed with the PCL

Physical health symptoms in seven bodily systems including cardiovascular, dermatological, gastrointestinal, genitourinary, musculoskeletal, neurological, and pulmonary assessed with dichotomous items (yes/no)

317 Gulf War veterans (83 women, 234 men); sample stratified on duty status (50% active study and 50% National Guard/Reserves) and sex (25% women, 75% men)

Cross-sectional/descriptive study

Wachen et al., 2013

Preventive Care and Treatment Adherence

Authors	Design	Sample	Medical Condition	MH Condition	Trauma Exposure	Result	Risk of Bias
Abdullah et al., 2015	Cohort study, retrospective/chart review only	40 veterans (29 women and 11 men)	Breast cancer by diagnosis in VA medical record	Schizophrenia or diagnosis in VA medical record, and reports of positive and negative symptoms in VA medical record	N/A	Participants with both disorders presented late in the disease course, had larger masses, and more had metastatic breast cancer compared to the healthy controls from Hynes et al. 2004; participants with both disorders reporting suicidal and/or homicidal ideation were more likely to reject ART	High; Selection bias: data compared to a "control group" from a different study (Hynes et al., 2004) recruited via different methods; <u>Selective outcome reporting;</u> did not assess the same outcomes as the control sample study; Confounding: no efforts to balance or match sample groups
Bradley, Rubinsky, et al., 2012	Cohort study, retrospective/chart review only	10,284 veterans (513 women and 9771 men) using VA healthcare who underwent major noncardiac surgery	Major noncardiac surgery by VA medical records	Alcohol use assessed with AUDIT-C in the year before the operation	N/A	5% of women positive for alcohol misuse, 38% of that group had severe misuse; 58% of women with alcohol misuse were classified by anesthesiologists as healthy; AUDIT-C scores ≥ 5 associated with increased risk for postoperative complications; AUDIT-C > 9 associated with increased postop inpatient care	Low; <u>Attrition bias:</u> measures based on administrative data available which included variable lengths of follow-up, and thus does not include consistent assessment for all participants

(Continued)

Table 1. Continued.

Authors	Design	Sample	Medical Condition	MH Condition	Trauma Exposure	Result	Risk of Bias
Breland et al., 2014	Cross-sectional/descriptive study	482 OEF/OIF veterans (227 women, 255 men) with PTSD	Medical Condition Medical comorbidities (including arthritis, asthma, cancer, stroke, COPD, ischemic heart disease, diabetes, esophageal/gastric/duodenal disorders, headache, heart failure, hypertension, and joint and spine disorder by ICD-9 codes in the VA medical record	MH Condition Initiation of PTSD psychotherapy and number of psychotherapy visits for PTSD by VA medical record	Trauma Exposure N/A	Result Among women, medical comorbidities were not associated with initiating psychotherapy for PTSD after adjusting for all covariates, but number of medical comorbidities was associated with fewer psychotherapy visits	Risk of Bias Low; Detection bias: use of VA medical record to detect comorbidities may lead to missing and/or inconsistent data as this approach assumes the conditions were static over time; operationalization of PTSD psychotherapy based on ≥ 1 outpatient VA visits does not include non-VHA psychotherapy visits, which were not assessed
Callegari et al., 2014	Cohort study, retrospective/chart review only	94,115 women veterans using VA primary care or women's health	Any use of prescription contraception (including pill, patch, ring, injection, implant and intrauterine device) by VA medical record	MH diagnoses by ICD-9 codes in the VA medical record during the study period and the FY preceding the study; MH diagnoses included depression, PTSD, anxiety, bipolar disorder, schizophrenia, and adjustment disorders; SUDs included alcohol use disorders and drug use disorders	N/A	Women with mental illness did not differ from women with neither mental illness or SUDs in prescription contraception; women with SUDs had 27% lower odds of prescription contraception, women with both diagnoses had 21% lower odds of prescription contraception compared to women with neither diagnosis	Low; Detection bias: reliance on VA medical records exclusively for contraceptive data fails to account for non-VA prescriptions or surgeries; women attempting to conceive, not sexually active, or in same-sex relationship(s) may have been included in analyses, potentially confounding results
Callegari et al., 2015	Cohort study, retrospective/chart review only	9,780 women veterans using VA primary care or women's health, using hormonal contraceptive (pill/patch/ring/injectable)	Medical Condition Hormonal contraceptive adherence by number of gaps in refills ≥ 7 days, length of gaps; contraceptive continuation by months of any contraceptive coverage over the 1-year study period and whether women had hormonal contraceptive coverage in the last week of FY13, by VA medical record	MH Condition MH diagnoses by ICD-9 codes in VA medical records, with and without comorbid SUD during the study period or the fiscal year preceding the study; MH diagnoses included depression, PTSD, anxiety, bipolar disorder, schizophrenia, and adjustment disorders; SUDs included alcohol use disorders	Trauma Exposure N/A	Adherence was similar between women with mental illness and women with no diagnoses; women with mental illness had increased odds of gaps > 30 days, and fewer months of coverage; women with mental illness and SUD has more gaps, longer gaps, and fewer months of coverage than women with no diagnoses	Risk of Bias Low; Detection bias: Reliance on medical records for psychiatric diagnoses may lead to missing and inconsistent data as this approach assumes that the conditions were chronic and did not change over time; adherence based solely on VA medical record, without any patient report of adherence
Weitlauf et al., 2013	Cross-sectional/descriptive study, chart review only	34,123 women veterans using VA primary care, with PTSD, depression, or no MH diagnoses	Cervical cancer screening by product number or procedural technology code for screening in VA medical record	PTSD and depression by at least two instances of diagnosis in VA medical record associated with face-to-face encounters; no MH diagnoses	N/A	77% percent of women with PTSD, 75% with depression, and 75% with no MH diagnoses were screened for cervical cancer; women with PTSD	High; Selection bias: women at VA medical centers with screening rates below 30% were excluded, which reduced total <i>N</i> and likely reduced

determined by the absence of any ICD-9 psychiatric diagnoses in VA medical record

were statistically more likely to be screened than the other two groups

variability; Detection bias: VA chart review does not account for women who received screening outside VA; Selective outcome reporting; the statistically significant difference in screening rates between MH groups may not be clinically significant

Note. MH = mental health; ICD-9-CM = International Classification of Diseases 9 Clinical Modification; BMI = Body Mass Index; BPD = Borderline Personality Disorder; PTSD = Posttraumatic Stress Disorder; PSS-I = PTSD Symptom Scale Interview; CIDI-SF = Composite International Diagnostic Interview – Short Form; MST = Military Sexual Trauma; LSA = Lifetime Sexual Assault; SUD = Substance Use Disorder; MDD = Major Depressive Disorder; GAD = Generalized Anxiety Disorder; GID = Gastrointestinal Disorders; BDO = Bowel Disorder Questionnaire; BDI-II = Beck Depression Inventory II; BAI = Beck Anxiety Inventory; PCL = PTSD Checklist; DRRI = Deployment Risk and Resilience Inventory; IBS = Irritable Bowel Syndrome; AUDIT-3 = Alcohol Use Disorders Identification Test 3; OEF/OIF = Operation Enduring Freedom/Operation Iraqi Freedom; SCID-I/IV = Structured Clinical Interview for Diagnostic and Statistical Manual of Mental Disorders IV; PHQ-9 = Patient Health Questionnaire 9; PCL-M = PTSD Checklist Military; TBI = Traumatic Brain Injury; UI = Urinary Incontinence; OAB = Overactive Bladder; UDI = Urogenital Distress Inventory; ILQ-7 = Incontinence Impact Questionnaire 7; PHQ-8 = Patient Health Questionnaire 8; GAD-7 = Generalized Anxiety Disorder 7; PCL-C = PTSD Checklist Civilian; DOD = Department of Defense; LUTS = Lower Urinary Track Symptoms; UDI-6 = Urogenital Distress Inventory 6; AUDIT-C = Alcohol Use Disorders Identification Test; ART = Adjuvant Radiation Therapy.

postdeployment health (see Danan et al, page 1362).²² The current review focuses on *mental health comorbid with nonmental health*, which was a topic within the mental health subheading.

Given the goals of the current review, a structured, systematic approach was taken to data abstraction and assessment of risk of bias. Methods were guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement for evaluating studies of healthcare interventions.^{28,29}

Data abstraction

Study elements from the 23 articles selected for inclusion were recorded in an abstraction form developed for this study by the authors. The initial abstraction form included inclusion and exclusion criteria from the study, study design, research question(s), sample, independent and dependent variables, methods of variable assessment, analytic approach, results, and conclusions. This form was initially pilot-tested and refined by all eight authors on two articles; through extensive discussion, no major modifications were deemed necessary. Next, information from each article was abstracted by two authors independently, and the recorded data were compared and discussed until consensus was reached. Two articles^{30,31} were excluded from full abstraction by consensus of a rater pair (UK and JC) based on the exclusion criteria established in the parent study; both studies had samples of women that were less than 75% of the total and neglected to stratify and/or explicitly discuss results for women veterans, as a result, 21 studies were included in the final review.

Risk of bias. The 13-item revised Research Triangle Institute (RTI) Risk of Bias tool was used to assess studies (all of which were observational) for potential sources of bias, including selection, performance, attrition, detection, reporting, information, and confounding biases.^{28,29} Reasoning for bias determinations were recorded to facilitate transparency and discussion of any discrepancies between evaluators.^{32,33} Overall bias rating was evaluated using the following criteria: (1) low risk of bias for results that are valid and represent true effects; (2) moderate risk of bias for results that are valid and represent a true effect and although the study was susceptible to some bias, these issues were not so extreme as to invalidate study results; and (3) high risk of bias for significant flaws and several types of biases that likely invalidate study results.³²

Results

We summarized findings into two major areas: (1) mental and physical health comorbidities, and (2) preventive care and treatment adherence. We also summarized limitations germane to understanding clinical complexity among women veterans, including methodological limitations, common types of bias, and notable gaps in the recent literature (see [Table 1](#)).

Mental and physical health comorbidities

Fifteen articles described comorbid mental and physical health conditions. Given the variety of mental health conditions included, we summarized findings based on the comorbid physical health conditions examined, with the exception of two studies, which pertained to deployment-related conditions.^{34,35}

Diabetes, cardiovascular diseases, and obesity

Three studies examined the relationship between mental health and diabetes, including the cardiovascular and medical sequela of diabetes.^{36–38} First, Banerjee and colleagues described the comorbidity of (1) mental illness (MI; anxiety, PTSD, or other disorders) and (2) serious mental illness (SMI; schizophrenia, bipolar disorder, psychosis, and major depression) and/or (3) substance use disorders (SUD; alcohol, drugs, and tobacco) among women veterans with diabetes, using VA medical records.³⁶ Overall, women veterans with diabetes were more likely to have MI than SUD, with major depressive disorder being the most common (28%), followed by anxiety disorder, schizophrenia, and bipolar disorder. Importantly, around one-third of the sample had medical complications of diabetes (macrovascular, microvascular or metabolic decompensation). Women with macrovascular complications of diabetes were more likely to have MI and/or SUD; those with metabolic decompensation were more likely to be in the SMI group than those without it.

Shen and colleagues examined types of depression (i.e., major and minor) among women veterans diagnosed with depression and diabetes, heart disease, or hypertension.³⁷ Women with diabetes only or diabetes with hypertension had higher rates of major depression, compared to those with hypertension only. The authors concluded that rates of depression in their sample were somewhat higher than the general population,³⁹ but consistent with research on depression co-occurring with diabetes.²⁰

Sambamoorthi and colleagues examined depression treatment patterns among women veterans with diabetes, coronary artery disease (CAD), or

hypertension.³⁸ Among women with diabetes, CAD, or hypertension, 54% received antidepressants only, 23% received psychotherapy with or without medication, and 23% did not receive any depression treatment. Across the sample, women with CAD were more likely to not receive any depression treatment, compared to those with hypertension, but were equally likely to receive psychotherapy (with or without medications). This study offered one of the first observations of differences in depression treatment among women veterans with chronic illness.

These three studies shared first and senior authors and reflect similar methodologies, including use of national VHA clinical data to characterize clinical complexity among women veterans, as well as being observational, cross-sectional and cohort studies that relied on chart review. Therefore, identification of the features of clinical complexity were limited to those entered in patients' VA medical records. However, in all three of these articles, efforts were made to increase identification of relevant cases, including the use of algorithms that utilize clinical information beyond diagnostic codes and/or extending the window of chart review to increase opportunity for identification of conditions in the course of care.^{36–38} These studies were evaluated as having a low risk of bias.

One study focused primarily on comorbid obesity and mental health conditions, and was also evaluated as having a low risk of bias.⁴⁰ Current borderline personality disorder and depression symptoms mediated the relationship between a history of sexual assault, including during military service, and current obesity among women veterans. Past year substance use was related to obesity as well, but did not mediate the relationship between sexual assault and obesity. The study used self-reported height and weight to calculate each participant's body mass index (BMI) and used self-reported history of borderline personality disorder diagnosis, creating a risk of detection bias in these variables.

Chronic neurological and musculoskeletal pain

Three studies focused on chronic headache or musculoskeletal pain complicating or complicated by PTSD, depression, and/or trauma exposure.^{41–43}

Two of these studies examined the relationships between pain and mental health conditions in large mixed-gender samples of Operation Enduring Freedom (OEF)/Operation Iraqi Freedom (OIF) veterans. Compared to male veterans, women veterans were more likely to endorse pain-related complaints and to report using prescription headache medication in the past year.^{42,43} In the full mixed-gender sample,

PTSD diagnosis was associated with higher rates of pain complaints (e.g., headaches, backaches, muscle pain); however, veterans with comorbid PTSD and depression diagnoses reported the most frequent pain complaints.⁴² Seng et al. found that PTSD, panic symptoms, and lifetime trauma exposure were associated with a greater likelihood of reported use of prescription headache medications in the past year.⁴³ In contrast, depressive symptoms were not related to use of prescription headache medications. In the Seng et al. study issues were identified with the selection of study participants, use of brief and nonvalidated measures and single-item measures, and failure to assess relevant confounds leading to the categorization of a moderate risk of bias.⁴³

Using a convenience sample of women veterans presenting for care in a VA women's clinic, Haskell and colleagues examined the associations between self-reported history of sexual trauma and persistent physical pain, pain intensity, and pain interference in any area of the body.⁴¹ Despite significant bivariate associations between military sexual trauma and the presence of persistent pain, when accounting for number of chronic conditions, alcohol use, and depression, sexual trauma was *not* associated with pain persistence. However, among women veterans who reported pain, self-reported sexual trauma history was significantly associated with both pain intensity (accounting for race and marital status) and pain interference (accounting for age, service connection, anxiety diagnosis history, and depression). Findings were limited, however, by use of a convenience sample of veterans seeking care in one VA clinic and by concerns related to the measurement of sexual trauma. Specifically, sexual trauma was analyzed as a single dichotomous variable that included forced sex as a civilian, forced sex while serving in the military, and military sexual harassment, thus this study was evaluated as having a moderate risk of bias.

Overall, this group of chronic pain-related studies are limited by lack of accounting for potential covariates, such as chronic medical conditions which are often associated with pain complaints (e.g., fibromyalgia, traumatic brain injury, physical injury). Measurement concerns included limited definition or assessment of pain (i.e., single-item or dichotomous measures), medication use (i.e., single-item self-report), and trauma (i.e., use of nonvalidated measures). In addition, concerns related to sample selection included different recruitment methods for men and women and use of a small convenience sample.^{41,43}

Gastrointestinal problems

Three studies examined the comorbidity between mental health conditions and gastrointestinal problems.^{44–46} All three studies on gastrointestinal problems were evaluated as using valid and reliable measures, and two studies^{45,46} included sensitivity analyses that did not find any differences in gastrointestinal problems between study participants and women who declined to participate. Therefore, these three studies were identified to carry a low risk of bias.

Maguen and colleagues examined gender differences in the association of mental health disorders and gastrointestinal disorders (GIDs) among veterans who had deployed to the US wars in Iraq and Afghanistan and who were new to VA healthcare.⁴⁴ Women were more likely than men to have irritable bowel syndrome (IBS) and dyspepsia/abdominal pain and less likely than men to have GERD/reflex esophagitis. Risk for all GIDs was greatest among women with depression (as compared to PTSD and generalized anxiety disorder). IBS was the GID most strongly associated with all three mental health conditions. Furthermore, veterans with more than one mental health condition had greater odds of GIDs compared to those with only one mental health condition, with women being more likely than men to have mental health comorbidity.

Savas and colleagues examined one-year prevalence of IBS and dyspepsia symptoms and their associations with anxiety, depression, and PTSD in a sample of women veterans seeking outpatient primary care in a VA women's health clinic.⁴⁵ Women reporting either IBS symptoms (38%) or dyspepsia (21%) reported significantly higher symptoms on measures of depression, anxiety, and PTSD, compared to women without IBS or dyspepsia symptoms. The odds of IBS or dyspepsia symptoms increased as mental health symptoms increased, particularly for anxiety, which was related to a 16-fold increase in IBS and a more than 40-fold increase in dyspepsia. Moreover, when adjusting for age, ethnicity and all mental health disorders simultaneously, only anxiety symptoms remained significantly associated with IBS and dyspepsia.

White and colleagues also sampled women veterans seeking primary care in VA, but focused primarily on the relationship between specific trauma types and IBS.⁴⁶ Several trauma types were related to greater risk for IBS, including interpersonal traumas, man-made disaster, and serious/life-threatening illness. While women veterans with IBS were more likely to report PTSD and depression symptoms than women

without IBS, this association did not fully account for the relationship between trauma experiences and IBS.

Urogenital symptoms

Three studies examined comorbidity between mental health diagnoses and urogenital symptoms.^{47–49} Bradley and colleagues used a telephone-based survey to sample women veterans who received care in VA to examine the relationships between urinary incontinence (UI), depression, and PTSD.⁴⁷ Accounting for covariates including age, BMI, race, exercise, pregnancies, history of urinary tract infections, and a history of sexual assault, UI was associated with PTSD, but not depression. Sexual trauma was also associated with UI. Although this study had possible detection bias related to the categorization of UI groups, overall the study was rated as having a low risk of bias. Also using a telephone-based survey, in a national study of recently deployed women veterans, Bradley and colleagues found that overactive bladder was associated with depression, anxiety, PTSD, and history of sexual trauma.⁴⁸ Bradley and colleagues used valid and reliable measures and conducted a sensitivity analysis on study participants and nonparticipants and did not note any differences between groups, and that study was also rated as carrying a low risk of bias. Lastly, Klausner and colleagues employed an in-person survey postprimary care appointments and found that women veterans with lower urinary tract symptoms (LUTS) reported higher rates of psychiatric comorbidities and lifetime sexual trauma than women without LUTS.⁴⁹ In addition, psychiatric comorbidities and sexual trauma increased the negative impact of LUTS on quality of life, but did not impact the severity of LUTS. Klausner and colleagues used valid and reliable methods in their study, and it was rated as having a low risk of bias.

Deployment

One article directly examined the role of deployment on mental health and physical health.³⁵ A second study examined the relationship between an infectious disease that is more easily contracted during deployment with depression and dysphoria among women veterans.³⁴

Wachen and colleagues examined the relationship between warzone exposure, PTSD symptoms, and physical health (in seven bodily systems, including cardiovascular, dermatological, gastrointestinal, genitourinary, musculoskeletal, neurological, and pulmonary) among women and men who deployed to the first US Gulf War.³⁵ Predeployment health was

assessed retrospectively and postdeployment health was defined as current health at the time of the study. In terms of physical health, all participants reported worse physical health at postdeployment than predeployment, and women veterans reported more genitourinary, musculoskeletal, and neurological symptoms than men. PTSD symptoms mediated the relationships among warzone exposure and all seven categories of physical health; no sex-based differences were identified. One measurement issue was identified with this study in that the authors did not examine the impact of military sexual trauma (MST) or other forms of interpersonal violence before or after deployment on physical health, yet overall the study was evaluated as having a low risk of bias.

Duffy and colleagues explored the relationships between chronic *T. gondii* infection, depression, and dysphoric mood among 70 women veterans.³⁴ *T. gondii* is a parasite to which internationally deployed personnel may be exposed; it has been associated with adverse mental health outcomes including suicidal behavior. There were significant bivariate relationships between *T. gondii* seropositivity and depression severity, confusion and anger, and overall mood disturbance. The authors were unable to conduct multivariate analyses or adjust for confounds due to the small number of women who screened positive for the parasite. Two methodological issues were identified with this study, leading to the designation of a moderate risk of bias. First the method of recruitment varied across groups, and second the small sample size precluded an examination of potential demographic confounds. Therefore, this study was evaluated as having a moderate risk of bias. Additional research regarding the role of *T. gondii* infections on mental health is warranted, especially in larger samples of women veterans, to generalize results and further explore the relationship to suicidal behavior.

Preventive care and treatment adherence

Six articles addressed (a) mental health symptoms that complicate medical care or (b) medical conditions that complicate mental health care.

Mental health conditions complicating medical care

Articles in this section focused on the role of mental health in timely engagement in medical care or screening, in postoperative complications, and on adherence to prescription contraceptive regimens.^{50–54}

Engagement in medical care or screening. Weitlauf and colleagues compared receipt of cervical cancer

screening among women veterans with PTSD, depression, or no mental health symptoms, using medical records for women who received VA care from 2003 to 2007.⁵⁰ Seventy-seven percent of women with PTSD, 75% with depression, and 75% with no mental health diagnoses were screened for cervical cancer. Women with PTSD were significantly more likely to be screened than women without mental health diagnoses. Additionally, women with depression or PTSD were more likely than those without mental health diagnoses to be screened if they were low users of primary care, but were less likely to be screened if they were high users of primary care. Several issues with potential bias were identified for this study including potential selection bias, detection bias, and selective outcome reporting (for details see Table 1); thus the study was categorized as having a high risk of bias.

Abdullah et al. examined healthcare outcomes among women veterans with schizophrenia or schizoaffective disorder who subsequently developed breast cancer and were eligible for adjuvant radiation therapy (ART) in VA.⁵¹ Women with schizophrenia or schizoaffective disorder presented later in the disease course, had larger masses, and a greater number had metastatic breast cancer upon presentation. The authors compared their results to results from a previous study on breast cancer outcomes in VA on those without mental illness.⁵⁵ Methodologically, there were several differences between the studies, including sample size, outcome measures, and length of follow-up, leading to categorization of this study as having a high risk of bias. Although Abdullah and colleagues used a potentially inappropriate control group, findings suggest that schizophrenia and schizoaffective disorder may delay treatment for breast cancer, resulting in worse prognosis.⁵¹

Postoperative complications. Bradley and colleagues utilized a retrospective medical record review to identify patients at risk for alcohol-related postoperative complications.⁵² Sixteen percent of men and 5% of women veterans undergoing major noncardiac surgery screened positive for alcohol misuse at levels associated with risk for postoperative complications. A majority of surgical patients (both men and women) with alcohol misuse were not identified as having possible alcohol-related diagnoses prior to surgery. In fact, 36% of men and 58% of women were instead classified by anesthesiologists as low risk or healthy. However, an important limitation is that measurement of alcohol misuse up to one year prior to surgery may have caused overestimation of risk for postoperative complications. This study was rated as having a low

risk of bias. Future research is needed to address this potential limitation and determine the extent to which findings are replicated when considering a more acute timeframe of pre-operative alcohol misuse.

Adherence to prescription contraceptive regimens. In a series of two studies, Callegari and colleagues examined the relationship between mental health and substance use disorders, and adherence to prescribed contraception regimens with a national sample of women veterans.^{53,54} In the first study, Callegari and colleagues found that women veterans with SUD or both SUD and comorbid mental illness were less likely to have any prescription contraceptive use during a one-year period, compared to women veterans with neither SUD nor mental illness.⁵³ However, among the subsample of women veterans with a prescription contraceptive, those with a mental illness or both mental illness and SUD were more likely to use highly effective contraceptive methods, compared to women veterans with neither SUD nor mental illness. In the second study, Callegari and colleagues found that women veterans with comorbid mental illness and SUD experienced more gaps between refills and reduced odds of continuous 12-month coverage, compared to women with neither mental illness nor SUD.⁵⁴ Findings from these two studies suggest that women veterans with mental health conditions and comorbid substance use disorders may be at heightened risk for inconsistent contraceptive use, and therefore unintended pregnancy. Therefore both studies were evaluated as low risk of bias, with the only issue being that authors relied on the VA medical record for their contraceptive, mental health, and adherence data which lacks information on any non-VA health-care women were receiving and patient self-report of adherence to contraception.

Physical health conditions complicating receipt of mental health care

Only one article focused on the role of medical conditions and receipt of treatment for mental health care. Breland and colleagues examined the role of medical comorbidities on PTSD treatment initiation and engagement among men and women veterans recently diagnosed with PTSD.⁵⁶ Medical comorbidities were not significantly associated with PTSD treatment initiation; however, among women veterans who initiated PTSD psychotherapy, those with more medical comorbidities had fewer psychotherapy visits for PTSD. In general this study used valid and reliable methods although reliance on the VA medical record for comorbidity and treatment attendance data fails to

take into account comorbidities that may have changed over time and any non-VA psychotherapy visits. This study was rated as having a low risk of bias.

Limitations

Methodological limitations

The studies included in our review were predominantly retrospective cohort studies reliant on the medical record or veterans seeking treatment in VHA. None examined the effectiveness of interventions. None included a comparison group of nonveteran women and only six included a male veteran comparison group.

Discussion

This systematic review of 21 articles identified in the women's health evidence map as part of the *mental health comorbid with non-mental-health* topic provides a glimpse into the scope and depth of clinical complexity among women veterans. The included studies represent a small body of knowledge on disparate clinical problems and collectively illustrate various comorbidities of mental and physical health conditions among women veterans, as well as the influence of comorbid mental and physical health conditions on preventive care and treatment adherence. Some of the findings raise awareness of the need to screen for and consider specific mental health conditions when addressing specific physical health conditions. However, at this time in which many women veterans are receiving care outside of VA settings from providers who may be unfamiliar with these comorbidities,²⁵ findings also underscore the need for further research in a number of areas.

Mental and physical health comorbidities

Overall, the reviewed literature was insufficient to inform specific treatment recommendations for specific clinical problems. However, the evidence strongly supports the need for heightened awareness of common mental health comorbidities (depression, PTSD, and anxiety) with diabetes, hypertension, chronic pain, gastrointestinal disorders (especially IBS and dyspepsia), urogenital complaints, as well as the influence of deployment and sexual trauma on multiple physical symptoms among women veterans.

An illustrative exemplar of the clinical complexity of comorbid mental and physical health conditions

was provided by Wachen and colleagues, who examined the associations among trauma exposure, PTSD symptoms, and multiple physical health symptoms in women and men veterans.³⁵ The authors assessed physical symptoms of seven body systems, effectively capturing individuals' somatic experiences, rather than the presence or absence of medical diagnoses. This is important in two ways. First, while many diagnosed physical health problems are serious and require medical treatment, some can be asymptomatic, such as hypertension. Assessing for symptoms allows for a description of clinical complexity as veterans experience it, rather than as diagnosed by clinicians. It is interesting to note that women veterans reported more genitourinary, musculoskeletal, and neurological symptoms than men – an area that requires further investigation. Second, the inclusion of symptoms from seven body systems allows for a broader representation of clinical complexity than studies that examine physical comorbidities from only one or two physical systems (e.g., cardiovascular and endocrine).

Preventive care and treatment adherence

Five of the six studies in this subcategory addressed the clinical complexity that mental illness or substance use bring to provision of and adherence to medical care. The findings of those studies demonstrate that the presence of mental illness or substance use impacts healthcare seeking, healthcare receipt, and specific medical treatment decisions related to physical health. Only one study, by Breland et al, addressed the clinical complexity in the other direction; that the presence of chronic medical illness can influence mental health care receipt and provision.⁵⁶

Risk of bias

In an effort to characterize the quality of recent research on clinical complexity among women veterans, we used a standardized approach to assess and describe risk of bias, described previously.³³ All studies in this systematic review were descriptive and observational with no intervention studies. Nine studies included retrospective medical record/medical claims review only; 12 studies included self-report data with/without medical record data. Overall, risk of bias tended to be low (17 studies). The studies were sound and well-implemented within the limitations of the available data and chosen methods. Three studies were deemed to have moderate risk of bias and one high risk of bias (See [Table 1](#)). Detection bias was the

most common type of bias, with different recruitment strategies used for women versus men or use of inappropriate comparison groups. Selection bias was the second most common type of bias and was related to lack of validated standardized measures and use of single-item measures. Thus, we consider this overall body of literature to generally be reliable and scientifically important, although limited in scope and volume.

Limitations of the current systematic review

Although the articles in this current review were identified in the women's health evidence map as part of the *mental health comorbid with nonmental health* topic, they include only a partial sample of the total physical health and mental health categories identified in the overall evidence map.²² Given the breadth of the overall evidence map, it is possible that there are individual studies classified outside of the *mental health comorbid with nonmental health* topic that are pertinent but were not included. Several women's health topics likely relevant to a better understanding of clinical complexity among women veterans are missing, including gynecological conditions (e.g., endometriosis, sexual dysfunction, chronic pelvic pain), perinatal care (e.g., miscarriage, infertility, postpartum depression), and healthy aging (e.g., menopause).

The limited number of studies addressing comorbid mental and physical health in women veterans leaves several critical gaps in the recent literature. We present these next, followed by recommendations to improve clinical practice and healthcare policy based on the findings of this review and identified knowledge gaps.

Gaps in the recent literature

Lack of knowledge about clinical complexity. Mental and physical health comorbidities complicate veterans' help-seeking and health care providers' delivery of optimal care. Given the broad spectrum of mental and physical health conditions and comorbidities experienced by women veterans, it is not surprising that a comprehensive understanding of clinical complexity among women veterans continues to be needed. For example, although hypertension is one of the most common medical conditions among women veterans, only two recent studies addressed hypertension in the context of mental health disorders, providing only a glimpse into the potential role of mental health disorders in the development and treatment of hypertension.⁵⁷

Limited knowledge about the impact of interpersonal trauma on clinical complexity. PTSD and military sexual trauma were, by far, the most frequently studied of all phenomena related to women veterans' health in 2008–2015.²⁷ Interpersonal trauma including childhood abuse, lifetime sexual trauma, MST, and intimate partner violence are highly prevalent in women veterans, and likely impact the profile of clinical complexity.^{3–6} Although nearly all studies in this review considered PTSD and/or at least one form of interpersonal or combat trauma, the current literature does not adequately address the impact of trauma on women veterans' physical and mental health. PTSD has been proposed as a systemic disorder, given the evidence of the negative impact of PTSD on multiple physical systems in the human body.⁵⁸ Future research on clinical complexity in women veterans will be improved by more comprehensive assessment and account of trauma history and PTSD symptoms. Lack of knowledge of the potential and actual role of PTSD and interpersonal trauma in chronic medical conditions may result in suboptimal or ineffective treatment for such conditions and their other mental health comorbidities.

Multiple mental health comorbidities. Most of the studies examined multiple mental health comorbidities, most commonly PTSD, major depressive disorder, anxiety disorders, SUD, and SMI. Only a few investigated a single mental health condition. This is not surprising, given the prevalence of multiple mental health comorbidities, especially PTSD comorbid with major depressive disorder, in some populations of women veterans, e.g. VA users.⁵⁹

Physical health complicating mental health and receipt of mental health care. Only one study addressed the potential impact of chronic illness/multiple physical health conditions on mental healthcare engagement.⁵⁶ The complexity that is created by physical illness comorbid with mental illness for women veterans remains understudied, including (1) the mental health sequelae of physical health disorders, for example, depression that follows cardiac disease, myocardial infarction, cancer, etc.; (2) the mental health sequelae of treatment of physical health disorders; (3) somatization disorders (e.g., chronic pain, gastrointestinal disorders); and (4) the burden of physical disease and the barriers to mental health care that burden creates (e.g., requiring dialysis or physical therapy several days per week).

Mental health complicating physical health and receipt of medical care. Only a handful of studies

examined the impact of specific mental health symptoms and disorders on women veterans' receipt of physical healthcare.^{50–54} These studies indicated that mental health conditions can interfere with timely medical care, which may have lethal consequences, as in the case of delayed screening or treatment for breast cancer among women veterans with schizophrenia or schizoaffective disorder.⁵¹ A deeper understanding of the ways in which mental health comorbidities interfere with receipt of healthcare, from screening and prevention to diagnosis and treatment, is essential to eliminating health disparities experienced by women veterans.

Lack of intervention studies. None of the identified studies were interventional. Most of the studies in the comorbid mental and physical health subcategory provided foundational groundwork for understanding the relationships between physical and mental health conditions among women veterans. The limited number of randomized controlled trials (RCTs) on women veterans' health is a significant gap in the literature; RCTs are the gold standard means of validating the appropriateness of a treatment for specific groups, such as women veterans.

Conclusions

We offer the following recommendations to improve clinical practice and healthcare policy related to comorbid mental and physical health conditions in women veterans. First, the limited scope of the literature necessitates further research on the implications of clinical complexity on women veterans' health, healthcare needs, healthcare treatment seeking, and treatment adherence. Much in the same way that integrated healthcare, including an interdisciplinary team of both medical and mental health providers, has been implemented in the VA and is a growing trend in civilian healthcare settings, healthcare researchers need to consider both mental and physical health, as well as their interplay, when designing future studies. Collaborative research initiatives that include medical and mental health scientists would provide an integrated approach.

Similarly, clinical practice may be improved through interdisciplinary approaches, in which the patient's entire care team collaborates to avoid gaps in assessment, screening, and treatment. The VA Primary Care Mental Health Integration (PCMHI) model, the implementation of which was mandated in 2008, is one example of such an approach.⁶⁰ PCMHI includes care coordination and interdisciplinary

collaboration, increasing the recognition and effective treatment of mental health problems in the primary care setting. Mental health providers are collocated in primary care settings with the purposes of early identification and treatment of mental health concerns, increasing access to mental health services, providing mental health consultation, and reducing barriers to mental health care, including stigma.⁶¹ VA's Whole Health approach to clinical care, focused on treating the whole veteran rather than just the symptoms of a disorder, is another successful example of this approach.⁶² As many women veterans receive care outside of VA, or use a combination of VA and non-VA care,²⁵ new methods of interdisciplinary communication, especially between VA and non-VA providers, are necessary to facilitate care across multiple systems. Given the recent Mission Act of 2018,²⁶ which expands veterans' options for seeking healthcare in the community, this interdisciplinary and interhealth care system communication will be essential to providing comprehensive and quality healthcare to women veterans. Given the prevalence of both interpersonal and combat trauma among women veterans,⁶³ future research and clinical practice may also be improved through comprehensive assessment of lifetime trauma history and consideration of its impact on the interplay of women veterans' physical and mental health concerns. In conclusion, the state of the literature suggests that unique issues may arise for women veterans experiencing comorbid medical and mental health concerns and enhanced awareness of these complexities is necessary to address the needs of this population.

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