

Do Depressive Symptoms Predict Blood Pressure Control in US Veterans?



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BACKGROUND: High blood pressure is the most common chronic condition among US veterans. Blood pressure control is essential to preventing and managing cardiovascular diseases. While depressive symptoms are a known risk factor for uncontrolled blood pressure and veterans experience high rates of depressive symptoms, no research has examined the relationship between depressive symptoms and blood pressure control among US veterans.

OBJECTIVE: We examined whether moderately severe-to-severe depressive symptoms, compared to none-to-minimal, are associated with higher risk of uncontrolled blood pressure among US veterans.

DESIGN: We analyzed a population-based sample of veterans from the National Health and Nutrition Examination Survey (2013–2016). Logistic regression models were adjusted for marital status, age, and body mass index. All analyses were weighted; results are generalizable to US veterans.

PARTICIPANTS: A sample of 864 veterans was analyzed, representing approximately 18.8 million US veterans.

MAIN MEASURES: Depressive symptoms were assessed by the Patient Health Questionnaire-9. Uncontrolled blood pressure was defined as average systolic blood pressure ≥ 130 and/or diastolic blood pressure ≥ 80 .

KEY RESULTS: For depressive symptoms, 78.2% ($SE = 1.6$) of US veterans had none-to-minimal, 18.2% ($SE = 1.2$) had mild-to-moderate, and 3.5% ($SE = 0.8$) had moderately severe-to-severe. Forty-three percent ($SE = 3.0$) of US veterans had uncontrolled blood pressure. Moderately severe-to-severe depressive symptoms, compared to none-to-minimal, were associated with lower risk for uncontrolled blood pressure ($aOR = .28$, 95% $CI [.09, .85]$). Mild-to-moderate depressive symptoms were not associated with blood pressure control ($aOR = .98$, 95% $CI [.59, 1.65]$).

CONCLUSIONS: US veterans with moderately severe-to-severe depressive symptoms were less likely to have uncontrolled blood pressure than veterans with none-to-minimal symptoms. Future research should examine factors unique to veterans that may explain findings opposite of the hypothesized relationship between depressive symptoms and blood pressure control.

KEY WORDS: blood pressure control; depressive symptoms; veterans; NHANES.

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INTRODUCTION

High blood pressure (BP), or hypertension, is the most common chronic condition among US veterans receiving Veterans Affairs (VA) healthcare.¹ Compared to nonveterans, veterans have 65% higher odds of hypertension.² According to VA data from 2010, 23.7% of veterans with hypertension have uncontrolled BP,³ now defined as systolic BP ≥ 130 and/or diastolic BP ≥ 80 ,⁴ with individual studies reporting higher rates (33.9–46.3%).^{5, 6} While studies have examined BP control among VA veterans, no studies have reported nationally representative rates of uncontrolled BP for US veterans. Because 48% of veterans are not enrolled in VA healthcare,⁷ nationally representative data is important to provide generalizable results about BP control in veterans who may or may not receive VA healthcare services.

One major risk factor for uncontrolled BP is depressive symptoms.⁸ Depressive symptoms predict poorer adherence to antihypertensive medications⁹ and clinical inertia,¹⁰ increasing the risk for uncontrolled BP. Veterans are particularly at risk for depression, with nationally representative data showing higher prevalence of depressive episodes among veterans aged 18–54 compared to nonveterans.¹¹ Among VA veterans in primary care clinics, 33% have some symptoms of depression, 20% have serious symptoms warranting further evaluation, and 10–12.5% have major depression warranting treatment.¹² While high rates of depressive symptomatology and uncontrolled BP have each been well documented among veterans, no studies have examined the *association* between depressive symptoms and BP control in a nationally representative sample of veterans. Much of the existing research about BP control in veterans has focused on those enrolled in VA healthcare who tend to be older and report poorer health status.^{13, 14} Less is known about BP control in US veterans more broadly, despite data from national surveys demonstrating higher cardiovascular disease

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risk in veterans compared to nonveterans.^{2, 15} To fill this gap in the literature, we examined whether moderately severe-to-severe depressive symptoms, compared to none-to-minimal symptoms, are associated with a higher likelihood of uncontrolled BP among US veterans from the National Health and Nutrition Examination Survey (NHANES). We hypothesized that, among US veterans, those with the most severe depressive symptoms will have higher odds of uncontrolled BP, after controlling for sociodemographic and health factors.

METHODS

Study Design and Data Collection

Data from the two recent waves of the NHANES (2013–2014; 2015–2016) were analyzed. The NHANES cross-sectionally assesses the health status of children and adults in the USA, using a stratified, multistage, probability sampling design to select participants representative of the civilian, non-institutionalized US population.^{16, 17} Study approval for recent waves of NHANES is approved by the National Center for Health Statistics Research Ethics Review Board. Use of this publicly available data for the present study did not meet the criteria for research with human subjects and did not require IRB oversight. An interviewer conducted a computer-assisted at-home interview. Physical measurements were conducted by a health technician inside a mobile examination center.

Study Sample

The analytic sample comprised veterans who endorsed service in the US Armed Forces, military Reserves, or National Guard. In addition, the sample was restricted to adults aged 20+ as these participants were asked questions about cardiovascular disease history. Only veterans with available data on all variables used in the present study were included in the analytic sample.

Key Measures

Depressive Symptoms. Depressive symptoms were assessed using the Patient Health Questionnaire-9.¹⁸ Items were rated in relation to the past two weeks from 0 (not at all) to 3 (nearly every day) and summed into a total score with higher sum scores indicating higher symptoms ($\alpha = 0.85$ in the analytic sample). We categorized symptoms as follows: none-to-minimal (≤ 4), mild-to-moderate (5–14), and moderately severe-to-severe (15+).¹⁸

Blood Pressure Control. After five minutes of seated rest, three BP measurements were taken on the right arm using a mercury sphygmomanometer; if use of the right arm was prohibited, the left arm was used.¹⁹ If one of the three measurements was interrupted, a fourth measurement was attempted. In accordance with the American College of

Cardiology (ACC) and American Heart Association (AHA) measurement guidelines,²⁰ the three SBP readings and three DBP readings were each averaged. If fewer than three measurements were obtained, then two measurements were averaged. If two measurements could not be obtained, then a single measurement was used. Outlier readings were recoded as missing (DBP < 10 mm Hg). We recoded the two variables reflecting SBP and DBP averages into one dichotomous variable reflecting BP control, defined as average SBP < 130 mm Hg and average DBP < 80 mm Hg.⁴ Participants were categorized as having controlled or uncontrolled BP.

Confounders. Nine sociodemographic and health-related factors known to affect BP control were considered as potential confounders.^{21, 22} Gender was self-reported as male or female. Consistent with previous studies of hypertension using nationally representative data,²³ age was categorized into 20-year blocks. Participants self-identified race and ethnicity: Mexican American, Other Hispanic, Non-Hispanic White, Non-Hispanic Black, Non-Hispanic Asian, and Other Race/Multi-racial. Race and ethnicity were recoded into four categories, with Mexican American and Other Hispanic collapsed into one category (Hispanic) to ensure consistency with the Revision to the Standards for the Classification of Federal Data on Race and Ethnicity and Non-Hispanic Asian, due to small sample size, subsumed into the Other Race/Multi-racial category.

Highest education completed was self-reported and recoded into three categories: high school, GED, or less; some college; and college or above. Marital status was self-reported and recoded into three categories: married or living with a partner; widowed, divorced, or separated; and never married. Ratio of family income to poverty was calculated by dividing self-reported family income by the specific survey year's Department of Health and Human Services poverty guidelines. The ratio was not calculated for participants who did not report income or reported their income using a broad category (< \$20,000; \geq \$20,000). Poverty-to-income ratio values were recoded based on the 2019 US Census Bureau categories²⁴: below 1.00 (below the poverty level), 1.00–1.99 (100–199% of the poverty level), and 2.00 and above (200% and above the poverty level).

A health technician measured height (m) and weight (kg) from which body mass index (BMI) was calculated (kg/m^2). Given the fairly linear relationship between BMI and BP,^{25, 26} BMI was analyzed as a continuous variable in the regression models. For descriptive purposes, BMI was categorized as underweight ($\text{BMI} < 18.5 \text{ kg}/\text{m}^2$), normal ($18.5 \text{ kg}/\text{m}^2 \leq \text{BMI} < 25 \text{ kg}/\text{m}^2$), overweight ($25 \text{ kg}/\text{m}^2 \leq \text{BMI} < 30 \text{ kg}/\text{m}^2$), or obese ($\text{BMI} \geq 30 \text{ kg}/\text{m}^2$).²⁷ Participants reporting they have never been diagnosed with hypertension, have a history of hypertension but no history of medication use, and have a history of medication use but no current use were coded as not currently taking prescription medication for hypertension. Participants reporting current use were coded as currently taking prescription medication for hypertension. Participants

who answered “don’t know” to any of the three medication questions were coded as missing.

Cardiovascular disease history was assessed by asking participants whether they were ever told they had congestive heart failure, coronary heart disease, angina, heart attack, or stroke. Participants who responded “yes” to any of the questions were coded as “yes” for cardiovascular disease history. Participants who responded “no” for each cardiovascular disease were coded as not having a history. Participants who responded negatively to some questions, but did not answer other questions were coded as missing information on cardiovascular disease history.

Statistical Analysis

We compared characteristics of the analytic sample versus veterans age 20+ who were excluded due to missing data using chi-squared tests and *t*-tests as appropriate. We described characteristics of US veterans included in our analytic sample using weighted percentages or means. Depressive symptomatology as a categorical predictor of BP control was tested using logistic regression analysis, controlling for sociodemographic and health-related confounders. Confounders were retained in the final model if they were significant in the crude and intermediate models.²⁸ Sampling weights (exam sampling weight) were used for all analyses in order for results to be representative of the US population of veterans age 20+. We combined two NHANES survey cycles and created a 4-year sample weight by dividing the 2-year sample weights by the number of cycles.²⁹ Analyses were conducted using survey analysis procedures in SAS 9.4 (SAS Institute, Inc., Cary, NC).

RESULTS

Analytic Sample

NHANES 2013–2016 enrolled 1070 veterans; 2 were younger than 20 years. Of the 1068 veterans aged 20+, we excluded those missing variables used in the analysis ($n = 108$ depressive symptoms, $n = 76$ BP control, $n = 82$ income, $n = 57$ BMI, $n = 3$ BP medications, $n = 3$ cardiovascular disease history). The final analytic sample included 864 veterans with complete data, representing approximately 18.8 million US veterans aged 20+. In unweighted analyses, veterans aged 20+ with missing data were more likely to have uncontrolled BP (59.2% vs. 46.1%, $\chi^2(1) = 7.85$, $p = .005$), have a high school education or less (41.2% vs. 32.1%, $\chi^2(2) = 7.06$, $p = .03$), and be age 80+ (29.4% vs. 18.5%, $\chi^2(3) = 12.50$, $p = .006$) compared to the final analytic sample.

Sociodemographic and Health Characteristics

The majority of US veterans had depressive symptoms in the none-to-minimal range (78.2%; $SE = 1.6$), 18.2% ($SE = 1.2$)

had mild-to-moderate, and 3.5% ($SE = 0.8$) had moderately severe-to-severe. Among US veterans, 43.0% ($SE = 3.0$) had uncontrolled BP. Characteristics for US veterans in relation to depressive symptom severity are shown in Table 1.

Association Between Depressive Symptom Severity and Blood Pressure Control

US veterans with moderately severe-to-severe depressive symptoms were less likely to have uncontrolled BP, compared to US veterans with none-to-minimal symptoms ($aOR = .28$, 95% CI [.09, .85]; Table 2). Likelihood of having uncontrolled BP did not differ among US veterans with mild-to-moderate versus none-to-minimal depressive symptoms ($aOR = .98$, 95% CI [.59, 1.65]; Table 2). Additional sociodemographic and physical health characteristics predicted BP control. US veterans who were widowed, divorced, or separated were more likely to have uncontrolled BP compared to veterans who were married or living with a partner ($aOR = 1.75$, 95% CI [1.10, 2.79]). US veterans aged 20–39 years had lower odds of uncontrolled BP compared to veterans aged 60–79 years ($aOR = .39$, 95% CI [.22, .70]). US veterans with higher BMI were more likely to have uncontrolled BP ($aOR = 1.06$, 95% CI [1.02, 1.09] per each kg/m^2 higher BMI; Table 2).

DISCUSSION

Our study is the first to examine the association between depressive symptoms and BP control in a nationally representative sample of US veterans. We found that nearly half of US veterans had uncontrolled BP, and more than one-fifth had depressive symptoms ranging from mild to severe. We hypothesized that, relative to none-to-minimal depressive symptoms, US veterans with moderately severe-to-severe symptoms would be more likely to have uncontrolled BP. Contrary to our hypothesis, we found that US veterans with moderately severe-to-severe depressive symptoms were substantially less likely to have uncontrolled BP compared to those with none-to-minimal symptoms.

Our estimate of 18.8 million US veterans is consistent with veteran population estimates from other nationally representative surveys.³⁰ The prevalence rate of uncontrolled BP among US veterans in the present study falls within the wide range reported in previous studies of veterans (23–57%).^{3, 31, 32} However, these studies defined uncontrolled BP as at or above 140/90 mm Hg. Our finding that 43.0% ($SE = 3.0$) of US veterans have uncontrolled BP provides a more contemporary estimate, applying the current definition of hypertension according to the 2018 ACC and AHA guidelines.⁴ However, the revised definition of hypertension is not universally agreed upon, with some professional organizations arguing for a higher hypertension target of 150/80 mmHg.³³ Therefore, some veterans classified as having uncontrolled BP in the present study may not need their BP controlled according to their physicians.

Table 1 Sociodemographic and Health Characteristics of US Veterans 20+ Years Old, Overall and By Depressive Symptom Severity, Weighted % (SE)

	Overall	Depressive symptoms		
		None-to-minimal	Mild-to-moderate	Moderately severe-to-severe
Age				
20–39 years	13.0 (1.8)	12.4 (2.0)	13.9 (3.2)	21.7 (7.6)
40–59 years	27.7 (3.0)	26.4 (2.7)	32.4 (6.2)	32.5 (9.6)
60–79 years	47.3 (2.6)	49.2 (2.8)	40.5 (5.4)	39.1 (13.1)
80+ years	12.0 (1.2)	12.0 (1.4)	13.2 (2.2)	6.7 (4.1)
Male	91.7 (1.4)	94.9 (1.1)	79.8 (4.6)	82.6 (8.6)
Race/ethnicity				
Hispanic	5.4 (0.9)	4.8 (1.0)	5.7 (1.3)	17.0 (5.6)
Non-Hispanic White	79.3 (1.9)	80.3 (2.0)	76.7 (3.9)	69.8 (8.3)
Non-Hispanic Black	10.6 (1.4)	10.0 (1.4)	13.7 (2.7)	9.8 (3.8)
Other race/multi-racial	4.7 (0.9)	4.9 (1.1)	3.9 (1.7)	3.5 (3.7)
Marital status				
Married or living with partner	70.8 (2.0)	73.3 (2.1)	63.1 (5.1)	55.3 (9.9)
Widowed, divorced, separated	21.1 (1.9)	18.8 (1.7)	29.3 (4.6)	29.7 (9.8)
Never married	8.1 (1.2)	7.9 (1.4)	7.5 (2.1)	15.0 (5.5)
Family income to poverty ratio				
Less than 1.00	7.9 (1.1)	7.2 (1.1)	8.9 (2.9)	18.5 (7.0)
1.00–1.99	20.9 (2.0)	18.8 (1.9)	27.6 (4.7)	29.9 (11.3)
2.00 and over	71.2 (2.5)	73.9 (2.3)	63.6 (6.2)	51.5 (14.7)
Education				
High school, GED, or less	26.7 (1.7)	25.8 (2.1)	28.8 (4.2)	36.9 (11.0)
Some college	41.4 (2.5)	39.7 (3.3)	44.5 (5.0)	61.0 (11.7)
College or above	32.0 (2.3)	34.5 (2.4)	26.7 (4.1)	2.2 (2.4)
Body mass index (kg/m ²)	29.7 (0.2)	29.4 (2.4)	31.0 (.72)	30.1 (1.4)
History of cardiovascular disease	20.5 (1.5)	20.0 (2.0)	21.9 (4.7)	24.5 (10.6)
Current blood pressure medication	36.2 (1.6)	34.7 (2.4)	42.6 (4.7)	37.3 (11.8)

Note: In the overall column, each cell represents all US veterans 20 years or older (e.g., 13.0% [SE = 1.8%] of US veterans are 20–39 years old). In the columns of depressive symptom category, each cell represents US veterans with the corresponding depressive symptom severity (e.g., 12.4% [SE = 2.0%] of US veterans with none-to-minimal depressive symptoms are 20–39 years old)

A fifth of US veterans experienced symptoms ranging from mild to severe. In the context of prior research, our findings suggest that US veterans as a whole tend to experience less severe (i.e., none-to-minimal) depressive symptoms compared to subpopulations, such as veterans in VA primary care. While 10–12.5% of veterans in VA primary care have serious depressive symptoms warranting treatment,¹² we found that only 3.5% (SE = 0.8) of US veterans have moderately severe-to-severe symptoms warranting treatment. These findings indicate that, although a small minority of US veterans experience the most severe depressive symptoms, a substantial portion (21.7%, SE = 7.6) experience at least mild depressive symptoms. Differential rates of severe depressive symptomatology may be attributable to differences in VA healthcare status or health service-seeking. VA patients have poorer self-reported health status, more chronic medical conditions, and greater medical resource use compared to the general patient population.¹⁴ As such, veterans using VA healthcare or seeking primary care services may have higher rates of more severe depressive symptomatology than US veterans in the general population.

We found that US veterans with moderately severe-to-severe depressive symptoms were less likely to have uncontrolled BP than veterans with none-to-minimal symptoms. These results run counter to previous literature demonstrating a positive association between depressive symptoms and cardiovascular risk.³⁴ Our findings may reflect unique aspects of the broader US veteran population that buffer against the expected adverse effects of depressive symptoms on BP

control. Veterans tend to have a lower poverty rate, higher income, and greater likelihood of health insurance coverage compared to nonveterans, which may facilitate BP control.³⁵

In addition, the unexpected relationship might be explained by a common factor driving both more severe depressive symptomatology and better BP control, such as higher overall healthcare utilization. US veterans with the most severe depressive symptoms may be more likely to engage in mental health services, which may be associated with greater likelihood of engaging in other healthcare services. Conversely, those with less severe depressive symptoms may be less likely to seek mental health care, diminishing the relationship between mental and physical health care engagement. Along these lines, one study of recent veterans found those with mental disorders had 42–146% higher VA healthcare utilization than those without mental disorders.³⁶ In turn, access to and utilization of healthcare leads to better clinical outcomes.³⁷ Physiological mechanisms underlying the relationship between more severe depressive symptoms and uncontrolled BP may also be worthy of investigation. Depressive symptoms may be associated with lower BP due to depression-induced alterations in neuropeptide Y levels that suppress sympathetic activity.³⁸ The lack of differential odds in uncontrolled BP between those with none-to-minimal and mild-to-moderate depressive symptoms might suggest a high threshold for depressive symptoms to alter physiological functioning.

Table 2 Uncontrolled Blood Pressure in Relation to Depressive Symptom Severity and Sociodemographic and Health Factors in US Veterans 20+ Years Old

	Uncontrolled blood pressure, weighted % (SE)	Crude OR [95% CI]	Adjusted OR [95% CI]
Depressive symptoms			
None-to-minimal	43.4 (3.2)	(Reference)	(Reference)
Mild-to-moderate	45.7 (5.8)	1.10 [0.66, 1.84]	.98 [.59, 1.65]
Moderately severe-to-severe	18.8 (8.1)	.30 [.10, .88]	.28 [.09, .85]
Age			
20–39 years	26.4 (4.4)	.40 [.22, .73]	.39 [.22, .70]
40–59 years	41.2 (4.0)	.79 [.54, 1.14]	.77 [.53, 1.12]
60–79 years	47.2 (4.6)	(Reference)	(Reference)
80+ years	48.3 (4.6)	1.04 [.61, 1.78]	1.06 [.57, 1.99]
Sex			
Male	44.3 (3.0)	(Reference)	–
Female	28.8 (8.3)	.51 [.23, 1.14]	–
Race/ethnicity			
Hispanic	38.0 (4.5)	.81 [.52, 1.25]	–
Non-Hispanic White	43.2 (3.4)	(Reference)	–
Non-Hispanic Black	47.3 (3.3)	1.18 [.83, 1.68]	–
Other race/multi-racial	35.9 (6.3)	.74 [.45, 1.22]	–
Marital status			
Married or living with partner	40.1 (3.3)	(Reference)	(Reference)
Widowed, divorced, separated	53.6 (5.4)	1.73 [1.09, 2.73]	1.75 [1.10, 2.79]
Never married	40.8 (7.5)	1.03 [.49, 2.15]	1.71 [.85, 3.44]
Family income to poverty ratio			
Less than 1.00	48.8 (7.1)	(Reference)	–
1.00–1.99	44.2 (4.1)	.83 [.47, 1.47]	–
2.00 and over	42.0 (3.7)	.76 [.42, 1.36]	–
Education			
High school, GED, or less	42.4 (5.5)	(Reference)	–
Some college	41.9 (3.5)	.98 [.66, 1.44]	–
College or above	44.8 (3.4)	1.10 [.65, 1.86]	–
Body mass index (per kg/m ²)	–	1.05 [1.02, 1.08]	1.06 [1.02, 1.09]
History of cardiovascular disease			
Yes	41.6 (4.7)	.93 [.64, 1.37]	–
No	43.3 (3.1)	(Reference)	–
Current blood pressure medication			
Yes	48.9 (4.8)	(Reference)	–
No	39.6 (3.4)	1.46 [.94, 2.26]	–

Note: Bolded values indicate statistical significance at $p < .05$. In the weighted % (SE) column, each number indicates the percent of US veterans 20+ years old with uncontrolled blood pressure within that row (e.g., 43.4% [SE = 3.2%] of US veterans with none-to-minimal depressive symptoms have uncontrolled blood pressure)

Several sociodemographic and health characteristics were associated with a lower likelihood of controlled BP. Widowed, divorced, or separated US veterans had a 75% greater likelihood of uncontrolled BP compared to US veterans who were married or living with a partner. Studies across multiple cohorts of NHANES have found an association between marriage or cohabitation and better BP control,^{39, 40} which may be due to better medication adherence⁴¹ and receipt of guideline-recommended care.⁴² However, the literature on marriage or cohabitation as a potentially protective factor against uncontrolled BP in veterans is more mixed.^{43, 44} We also found that US veterans aged 20–39 years were less likely to have uncontrolled BP than veterans aged 60–79 years, which is consistent with research demonstrating that uncontrolled BP becomes increasingly prevalent for veterans with advancing age.⁴⁵ We also found that higher BMI was associated with higher odds of uncontrolled BP among US veterans, similar to findings from a longitudinal study of over 8 million VA veterans.⁴⁶

One limitation of our study is the operationalization of BP control based on average readings from one sitting. BP control status in our study does not necessarily reflect hypertension status. Previous research has found that 42% of patients have

their hypertension status misclassified.⁴⁷ Thus, caution should be exercised in generalizing findings of BP control to hypertension control. Another limitation is the small number of women in our sample. Future research should examine the relationship between depressive symptoms and BP control using datasets with greater female veteran representation, such as through the VA Women's Health Research Network.⁴⁸ Additionally, directionality of the relationship between depressive symptoms and BP control cannot be assumed, as NHANES data are cross-sectional. As we did not assess current pharmacological treatment for depression, it is possible that some participants with none-to-minimal depressive symptoms were successfully managing symptoms using antidepressants that elevate BP as a side effect.³⁸ Although current BP medication status was not a confounding variable in the relationship between depressive symptoms and BP control, it is possible that veterans with moderately severe-to-severe symptoms were more likely to have hypertension and be prescribed BP medication, thereby appearing to have better BP control.

One notable strength is the novelty of examining the association of depressive symptoms and BP among a nationally representative sample of US veterans, a population with high

cardiovascular disease risk.¹⁵ Although one-time BP measurements are not an ideal proxy for BP control, it reflects the common use of one-time BP measurements in primary care settings. Results can inform primary care providers' decisions to assess depressive symptoms among veterans with high BP or BP control when treating depressive symptoms. In addition, our study examined depressive symptom severity versus depression diagnosis, thus findings reflect the differential relationships of depressive symptom severity with BP control, and avoids the known problem of under-documentation of veterans' depression in primary care and other settings.⁴⁹

Overall, our findings demonstrate the great clinical need for better BP management, as nearly half of US veterans have uncontrolled BP as defined by the most recent ACC and AHA guidelines.⁴ Furthermore, US veterans may benefit from wider depression screening by both VA and non-VA healthcare systems to alleviate severe symptoms and prevent worsening of mild-to-moderate symptoms. Finally, to better understand our study's unexpected findings, subsequent research should investigate explanatory factors driving the relationship between more severe depressive symptoms and a lower likelihood of uncontrolled BP. Future epidemiological studies can specifically examine the contributions of health insurance and healthcare access among veterans using other nationally representative datasets (e.g., National Health Interview Survey), while laboratory-based studies can explore the physiological effects of depressive symptoms on BP regulation (e.g., testing neuropeptide Y levels as a mediator between depressive symptoms and BP control).

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Declarations:

Conflict of Interest: The authors declare that they do not have a conflict of interest.

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