Excessive and Premature New-Onset Cardiovascular Disease Among Adults With Bipolar Disorder in the US NESARC Cohort

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ABSTRACT

Background: Cross-sectional studies demonstrate increased prevalence of cardiovascular disease (CVD) among adults with bipolar disorder. However, there is a paucity of prospective data regarding new-onset CVD among adults with bipolar disorder.

Method: Analyses compared the 3-year incidence of CVD (via participant-reported physician diagnoses) among participants with *DSM-IV* diagnoses of bipolar I disorder (n = 1,047), bipolar II disorder (n = 392), major depressive disorder (MDD; n = 4,396), or controls (n = 26,266), who completed Wave 1 (2001–2002) and Wave 2 (2004–2005) of the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC). Analyses also compared the age of participants with new-onset CVD across groups. Multivariable analyses controlled for age, sex, race, cigarette smoking, hypertension, obesity, and alcohol and drug use disorders.

Results: The 3-year incidence of CVD among adults with bipolar I disorder, bipolar II disorder, MDD, and among controls was 6.30%, 5.74%, 3.98%, and 3.70%, respectively. The covariate-adjusted incidence of CVD was significantly greater among participants with bipolar I and II disorders versus controls and versus participants with MDD. Adjusted odds ratios (95% CI) were 2.58 (1.84–3.61; $P < .0001$) for bipolar I disorder vs controls; 2.76 (1.60–4.74; $P = .0004$) for bipolar II disorder vs controls; 2.11 (1.46–3.04; $P = .0001$) for bipolar I disorder vs MDD; 2.25 (1.26–4.01; $P = .007$) for bipolar II disorder vs MDD; and 1.22 (0.99–1.51; $P = .06$) for MDD vs controls. Bipolar I disorder participants with new-onset CVD were 10.70 ± 2.77 years younger than MDD participants with new-onset CVD and 16.78 ± 2.51 years younger than controls. Bipolar II disorder participants with new-onset CVD were 7.92 ± 3.27 years younger than MDD participants with new-onset CVD and 13.99 ± 2.79 years younger than controls.

Discussion: Adults with bipolar disorder are at significantly and meaningfully increased risk to develop CVD over the course of 3 years, even as compared to adults with MDD, and despite controlling for multiple potential confounds. Combined with very early age of CVD onset, this finding underscores the need for early and assertive CVD prevention strategies for people with bipolar disorder.

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Bipolar disorder is a severe, recurrent mood disorder with substantial burden of psychiatric symptoms including those related to depression, mania, comorbid anxiety and substance use disorders, and neurocognitive dysfunction.[1] In addition to the burden of psychiatric symptoms in bipolar disorder, there is an enormous burden of premature and excessive cardiovascular disease (CVD). Cardiovascular disease is the leading cause of death in bipolar disorder, occurring a decade prematurely and with a mortality rate ratio of more than 2.[2]

Clinical Points

- Adults with bipolar disorder are at greatly increased risk to develop cardiovascular disease; this increased risk exceeds what can be explained by expected risk factors such as smoking, obesity, and hypertension.
- Adults with bipolar disorder develop cardiovascular disease at a far younger age than adults without mood disorders.
- It is crucial to integrate an emphasis on cardiovascular health and cardiovascular risk factors in the assessment, monitoring, and treatment of people with bipolar disorder, regardless of how young they are.

Although the precise causes of this increased burden of CVD remain unknown, there is increased prevalence of multiple sources of CVD risk among patients with bipolar disorder, including traditional CVD risk factors (eg, hypertension, dyslipidemia, diabetes, obesity, smoking), substance use disorders, sedentary lifestyle, and novel putative CVD risk factors (eg, endothelial dysfunction, inflammation).[3] Many mood-stabilizing medications quite clearly confer risk of metabolic side effects such as obesity, dysglycemia, and dyslipidemia.[4] However, to date, evidence that these medications cause excessive CVD or CVD mortality is lacking.[5] Indeed, the excess CVD mortality associated with bipolar disorder was noted prior to the advent of mood-stabilizing medications.[6] Cardiovascular disease risk factors (obesity, hypertension, dysglycemia, dyslipidemia) among adults with bipolar disorder are associated with increased functional impairment, unemployment, suicide attempts, more manic and depressive episodes, increased treatment costs, and hospitalizations.[3] As such, greater understanding regarding the association between bipolar disorder and CVD may be advantageous in terms of improving both psychiatric and medical outcomes.

There is robust evidence of increased CVD mortality in bipolar disorder, and increased cross-sectional prevalence of CVD among people living with bipolar disorder, including previous findings from Wave 1 of the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC).[7–9] However, few previous studies have examined the association between bipolar disorder and new-onset CVD prospectively.[10–13] These previous studies are constrained either by a small number of participants with bipolar disorder or by nonrepresentative clinically derived samples. As such, to date, little is known regarding the relative incidence of CVD among adults with bipolar disorder versus the general population. Similarly, to our knowledge, previous studies have not directly compared the incidence of CVD among participants with bipolar disorder versus those with major depressive disorder (MDD). We therefore examined new-onset CVD in a large representative sample of the United States, and examined the hypothesis that, after controlling for demographic variables, participants with bipolar disorder will have significantly higher risk of new-onset CVD compared to participants with MDD and compared to participants without mood disorders. Further, given previous findings of premature CVD among adults with bipolar disorder,[7] we hypothesized that the age of subjects with new-onset CVD would be youngest among participants with bipolar disorder, followed by MDD, and finally controls.

METHOD

Participants

Participants were identified from among respondents who completed both the 2001–2002 Wave 1 of the NESARC and the 2004–2005 Wave 2 interviews 3 years (mean ± standard error [SE] = 36.96 ± 0.14 months) later.[14] The NESARC is a representative sample of the United States conducted by the National Institute on Alcohol Abuse and Alcoholism (NIAAA). A detailed description of Wave 1 of NESARC can be found elsewhere.[14] Briefly, 43,093 noninstitutionalized civilian respondents, aged 18 years and older, completed face-to-face computer-assisted personal interviews. Blacks, Hispanics, and adults aged 18–24 years were oversampled. The overall Wave 1 response rate was 81%.[14] After excluding respondents who were ineligible for Wave 2 (eg, deceased), 86.7% of respondents (n = 34,653) were reinterviewed, and sample weights were developed to additionally adjust for Wave 2 nonresponse. The weighted data were then adjusted to represent the US civilian population based on the 2000 census. After adjustment, comparisons between Wave 2 respondents and the target population (comprising Wave 2 respondents and eligible nonrespondents) indicated that there were no significant differences in terms of a number of Wave 1 sociodemographic measures or any lifetime substance, mood, anxiety, or personality disorders.

Assessment

Psychiatric diagnoses. Psychiatric diagnoses are based on the NIAAA Alcohol Use Disorder and Associated Disabilities Interview Schedule–*DSM-IV* Version (AUDADIS-IV).[15] Participants were considered to have bipolar disorder if, at Wave 1, they had a lifetime manic, hypomanic, or mixed episode that was not secondary to substance use or a general medical condition.[14] This study examines participants with *lifetime* diagnoses of bipolar disorder and MDD because selecting solely participants with 12-month prevalence would introduce a selection bias into the analysis, as not all individuals have mood episodes in a given year.

The anxiety disorders included in the present study are social anxiety disorder, panic disorder, and generalized anxiety disorder. The NESARC provides information regarding daily nicotine use and regarding abuse of and dependence on alcohol and illicit drugs. Participants with a lifetime history of abuse of or dependence on alcohol or any illicit drugs were considered to have lifetime substance use disorder. The AUDADIS-IV diagnoses of substance use disorder and of mood and anxiety disorders have demonstrated adequate reliability and validity.[14]

Information regarding childhood neglect, physical abuse, and sexual abuse was introduced in Wave 2, and is included here due to known associations with CVD.[16]

Table 1. Wave 1 Demographic and Clinical Variables Among Adults With Bipolar I Disorder (BD-I), Bipolar II Disorder (BD-II), Major Depressive Disorder (MDD), and Controls

Variable	BD-I (n = 1,047)	BD-II (n = 392)	MDD[a] (n = 4,396)	Controls (n = 26,266)	χ^2 or F	df	P	Linear Trend Test χ^2	df	P
New-onset cardiovascular disease, %	6.30	5.74	3.98	3.70	3.43	3	.0220	14.78	1	.0001
Age, mean ± SE, y	36.64 ± 0.51	33.45 ± 0.81	42.87 ± 0.28	44.92 ± 0.19	126.97	3	.0000	335.97	1	.0000
Female, %	55.72	59.85	67.39	49.43	76.46	3	.0000			
White, %	70.59	70.45	78.77	69.47	17.41	3	.0000			
Married, %	51.34	44.17	57.94	65.10	33.83	3	.0000			
Completed high-school or greater, %[b]	82.77	85.44	88.47	85.84	6.24	3	.0009			
Currently employed, %	64.09	75.96	69.43	67.47	6.64	3	.0006			
Personal income, %										
$0–$19,999	58.93	53.50	47.56	44.49	9.64	9	.0000			
$20,000–$34,999	21.80	26.23	22.96	23.04						
$35,000–$69,999	15.70	16.33	22.08	23.45						
$70,000+	3.57	3.93	7.39	9.02						
Anxiety disorder (not including specific phobia), %	47.55	39.40	31.73	6.05	104.88	3	.0000	828.19	1	.0000
Alcohol abuse or dependence, %	55.90	52.46	40.79	27.32	55.81	3	.0000	263.57	1	.0000
Drug abuse or dependence, %	37.24	27.77	17.15	8.10	58.63	3	.0000	485.86	1	.0000
Daily smoker, %[c]	48.41	42.42	41.67	33.72	32.92	3	.0000	57.25	1	.0000
Obese (BMI ≥ 30), %[d]	29.64	27.58	27.81	21.38	22.61	3	.0000	21.34	1	.0000
Hypertension, %	17.09	14.52	17.95	17.02	1.18	3	.3244	0.51	1	.4738
Early physical abuse, %[e]	22.09	14.51	14.41	6.25	52.51	3	.0000	163.65	1	.0000
Early sexual abuse, %[e]	24.41	22.80	20.71	7.52	75.51	3	.0000	184.52	1	.0000
Early neglect, %[e]	22.89	16.89	16.73	9.08	46.61	3	.0000	119.41	1	.0000

[a]The sample of MDD excluded those patients with a history of mixed, manic, or hypomanic disorder.
[b]Completed high school or greater.
[c]For those who smoke cigarettes every day.
[d]BMI = (weight in pounds × 703)/height in inches squared.
[e]Ascertained at Wave 2.
Abbreviations: BMI = body mass index, SE = standard error.

Self-reported height and weight were systematically obtained in NESARC Wave 1. Obesity was defined as having a body mass index (BMI [weight in pounds × 703/height in inches squared]) of ≥ 30.

Medical diagnoses. Wave 1 and Wave 2 NESARC respondents were asked about the presence of 11 medical conditions in the past year: arthritis, hypertension, gastritis, stomach ulcer, liver cirrhosis, other liver disease, angina, arteriosclerosis, heart attack, tachycardia, and other heart disease. Cardiovascular disease was considered present if participants reported that a physician had diagnosed arteriosclerosis, angina, or myocardial infarction. Participants with past-year history of CVD at Wave 1 were excluded from analyses.

For primary analyses, participants were divided into 4 groups: participants with lifetime bipolar I disorder (n = 1,047) or bipolar II disorder (n = 392), participants with lifetime MDD (n = 4,396), and controls with neither of these conditions (n = 26,266; controls could have non-MDD, non–bipolar disorder diagnoses including anxiety disorders and substance use disorder).

Statistical Analyses

χ^2 Tests for contingency tables were computed to compare the distribution of the proportions across groups, and regression analyses were used to compare these groups on dimensional measures. A linear χ^2 test was used to examine new-onset CVD because of the expectation of ordering effects. Logistic regression analyses were computed to examine new-onset CVD controlling for age, sex, race, cigarette smoking, hypertension, obesity, and alcohol and drug use disorders and are reported using adjusted ORs (AORs). All analyses, including calculation of SEs and 95% confidence intervals (CIs) were conducted with SUDAAN software (RTI International) to adjust for the design effects of the NESARC.

RESULTS

New-Onset Cardiovascular Disease

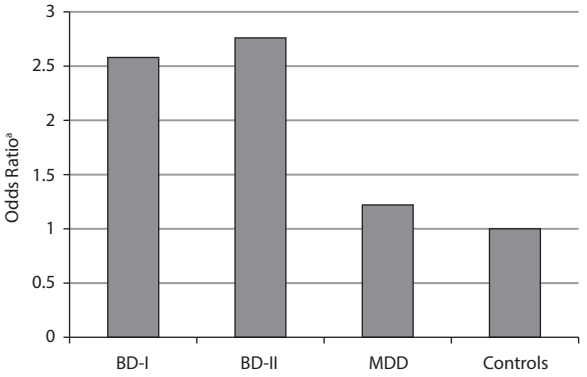
Table 1 contains information regarding between-group differences in demographic and clinical variables among participants with bipolar disorder, participants with MDD, and controls. Among NESARC participants without any form of CVD in Wave 1, the number of incident cases of arteriosclerosis, angina, and myocardial infarction was 413, 908, and 201, respectively. Table 2 depicts pairwise comparison between the different groups with respect to incidence of CVD and age of participants who developed CVD. The incidence of CVD was significantly greater among participants with bipolar I disorder (6.30%; 95% CI, 4.73%–8.35%) and bipolar II disorder (5.74%; 95% CI, 3.46%–9.38%) as compared to participants with MDD (3.98%; 95% CI, 3.33%–4.76%), which was in turn significantly greater as compared to controls (3.70%; 95% CI, 3.41%–4.02%; $\chi^2_1 = 14.78$, $P < .0001$). The covariate-adjusted incidence of CVD was significantly greater among participants with bipolar I and II disorder versus participants with MDD ([bipolar I disorder vs MDD] AOR = 2.11; 95% CI, 1.46–3.04; $P = .0001$; [bipolar II disorder vs MDD] AOR = 2.25; 95% CI, 1.26–4.01; $P = .007$) and versus controls ([bipolar I disorder vs

Table 2. Cardiovascular Disease Among Adults With Bipolar I Disorder (BD-I), Bipolar II Disorder (BD-II), Major Depressive Disorder (MDD), and Controls

	New-Onset Cardiovascular Disease[a]					Age of Subjects With New-Onset Cardiovascular Disease			Age Difference of Subjects With New-Onset Cardiovascular Disease			
Group Comparison	Adjusted Odds Ratio	95% CI		P Value	Group	Mean	Standard Error	Group Comparison	Mean Difference	SE	t Score	P Value
BD-I vs BD-II	0.94	0.50	1.76	.8344				BD-I vs BD-II	−2.79	3.86	−0.72	.4733
BD-I vs MDD[b]	2.11	1.46	3.04	.0001				BD-I vs MDD	−10.70	2.77	−3.86	.0003
BD-II vs MDD	2.25	1.26	4.01	.0065				BD-II vs MDD	−7.92	3.27	−2.42	.0181
BD-I vs controls	2.58	1.84	3.61	.0000	BD-I	42.11	2.43	BD-I vs controls	−16.78	2.51	−6.68	.0000
BD-II vs controls	2.76	1.60	4.74	.0004	BD-II	44.90	2.77	BD-II vs controls	−13.99	2.79	−5.02	.0000
MDD vs controls	1.22	0.99	1.51	.0585	MDD	52.82	1.74	MDD vs controls	−6.08	1.82	−3.34	.0014
Controls vs controls	1.00	1.00	1.00	NA	Controls	58.89	0.71	Controls vs controls	0.00	NA	0.00	NA

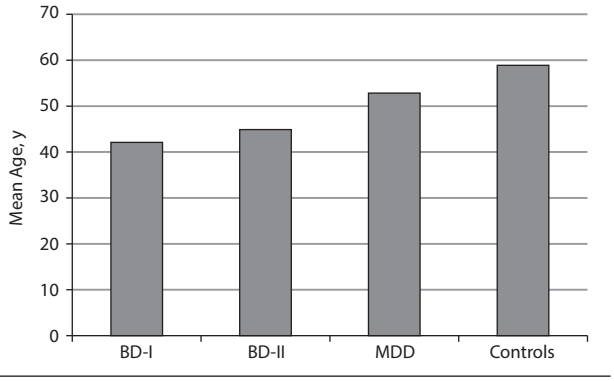
[a]Adjusting for age, sex, race, cigarette smoking, hypertension, obesity, and alcohol and drug use disorders.
[b]The sample of MDD excluded those patients with a history of mixed, manic, or hypomanic disorder.
Abbreviation: NA = not applicable, SE = standard error.

Figure 1. Adjusted Odds Ratios for New-Onset Cardiovascular Disease Among Adults With Bipolar I Disorder (BD-I), Bipolar II Disorder (BD-II), Major Depressive Disorder (MDD), and Controls



[a]Adjusting for age, sex, race, cigarette smoking, hypertension, obesity, and alcohol and drug use disorders.

Figure 2. Mean Age at Wave 1 of Adults With Bipolar I Disorder (BD-I), Bipolar II Disorder (BD-II), Major Depressive Disorder (MDD), and Controls Who Reported New-Onset Cardiovascular Disease at Wave 2



controls] AOR = 2.58; 95% CI, 1.84–3.61; $P < .0001$; [bipolar II disorder vs controls] AOR = 2.76; 95% CI, 1.60–4.74; $P = .0004$). The difference between participants with bipolar I and II disorder was not significant (AOR = 0.94; 95% CI, 0.50–1.76; $P = .83$). Similarly, the difference between MDD participants and controls was not significant (AOR = 1.22; 95% CI, 0.99–1.51; $P = .06$) (Figure 1).

Age of Participants With New-Onset Cardiovascular Disease

The mean ± SE age of participants with bipolar I disorder who developed new-onset CVD (42.11 ± 2.43 years) was nearly 17 years younger than that of control participants with CVD (58.89 ± 0.71 years) and nearly 11 years younger than that of MDD participants with CVD (52.82 ± 1.74 years). The mean age of MDD participants who developed CVD was 6 years younger than that of control participants who developed CVD. The difference in mean age between participants with bipolar I versus II disorder who developed CVD was not significantly different ($t = -0.72$, $P = .47$). These differences are substantially greater than overall between-group differences in age (Figure 2).

DISCUSSION

This study found a nearly 3-fold increased risk of developing new-onset CVD among adults with bipolar disorder versus controls when results were controlled for age, sex, race, cigarette smoking, hypertension, obesity, and alcohol and drug use disorders. Even compared to participants with MDD, those with bipolar disorder have significantly greater incidence of CVD. The mean age of participants with bipolar I disorder with new-onset CVD was nearly 11 years younger than that of MDD participants with new-onset CVD and nearly 17 years younger than that of controls. The mean age of participants with bipolar II disorder with new-onset CVD was nearly 8 years younger than that of MDD participants with new-onset CVD and nearly 14 years younger than that of controls. As hypothesized, an ordering effect was evident across groups: bipolar disorder > MDD > controls for new-onset CVD and bipolar disorder < MDD < controls for age of participants with new-onset CVD. These findings from a representative population sample extend previous findings of excessive and premature cross-sectional prevalence of CVD among people with bipolar disorder. Importantly, the fact that these findings are not explained by traditional CVD risk factors suggests the role of additional mechanisms.

In the present study, 6.30% of participants with bipolar I disorder and 5.74% of participants with bipolar II disorder reported being diagnosed with CVD by a physician. Relatively few studies regarding CVD (as opposed to CVD mortality) are available for comparison. A Canadian, population-based study examined the incidence of cardiovascular hospitalization over a period of up to 4 years of follow-up among 5,999 adults with a hospital discharge diagnosis of bipolar disorder compared to a matched population-proxy group with discharge diagnoses of appendicitis.[12] The rate of cardiovascular events was higher in the bipolar disorder group (4.67%) as compared to the appendicitis group (2.60%). After the researchers controlled for socioeconomic status, tobacco-related problems, diabetes, and lipid disorders, this difference comprised a significant 1.66 adjusted hazard ratio (95% CI, 1.37–2.07) of incident cardiovascular hospitalization in the bipolar disorder group versus the appendicitis group.

In a prospective Taiwanese administrative database study,[10] the incidence of acute myocardial infarction requiring treatment in the emergency department was greater among bipolar disorder participants (2.24%) compared to appendectomy participants (1.72%); however, this difference did not achieve statistical significance. That study constrained analyses to participants aged 45 years or older and yielded a bipolar disorder sample with a mean age of 54.8 years, which may have limited its ability to detect intergroup differences in light of evidence that excess CVD mortality among people with mood disorder is especially pronounced at younger ages.[2,17]

A recent study[13] examined the incidence of CVD during 11.5 years of follow-up of the Baltimore Epidemiologic Catchment Area Study. The incidence of CVD during follow-up was 8.77% in the bipolar disorder group, 7.14% in the MDD group, and 4.27% in the control group ($P = .12$). The AOR (controlling for age, hypertension, smoking, psychotropic medication use, and history of major depressive episodes) for bipolar disorder participants as compared to control participants was 2.97 (95% CI, 1.40–6.34). These findings suggest similar ordering effects as those observed in the current study. Previous studies, including NESARC data, provide evidence of ordering effects for a broad range of psychiatric characteristics.[18] The question arises as to the mechanism of this association. This may be owing to a secondary effect of mood disorder subtype on comorbidity, to genetic and environmental factors that contribute similarly to greater propensity for increased burden of psychiatric symptoms, or to increased burden of general medical conditions such as CVD. Indeed, even within bipolar disorder, there is preliminary evidence of greater physiologic toxicity (eg, inflammation, oxidative stress) in mania than in depression.[19] It is tempting to speculate that antimanic medications may explain part of this association, as they are frequently associated with weight gain and other metabolic disturbances.[4] However, only one-quarter of bipolar disorder participants reported exposure to antimanic medications, and they were not more likely to develop CVD. Clearly, further research is warranted regarding the biological, psychological, and environmental factors that underpin this ordering effect, as this may yield insights regarding pathophysiology and treatment.

The mean age of bipolar disorder participants with new-onset CVD was substantially younger than MDD participants with new-onset CVD and control participants with new-onset CVD. This finding is made more compelling by the fact that the bipolar disorder group was composed disproportionately of females, who tend to develop CVD 10–15 years later than do males.[20] However, the strength of this finding is tempered by the fact that the mean age in the overall bipolar disorder group was younger than in the MDD or control groups. As such, the between-group differences in age of participants with new-onset CVD may be partially explained by baseline differences in age. We elected not to control for group age as a covariate because we considered age at onset of CVD an important outcome. Nonetheless, the age differences of participants with CVD greatly exceeded the overall between-group differences in age. Similarly, previous cross-sectional findings from Wave 1 NESARC indicated that bipolar disorder participants with CVD were 14 years younger than adults with CVD who do not have mood disorders.[7] It is noteworthy that of the 4 prospective studies of new-onset CVD that compared adults with bipolar disorder to a control group, the only one that did not find evidence of increased risk for CVD among bipolar disorder participants also included a substantially older sample.[10] Individuals with bipolar disorder have greater health service utilization, both psychiatric and medical, than the general population, raising the question of whether this increased access to health care professionals may lead to earlier diagnoses than in the general population. However, this seems unlikely given that the overwhelming majority of studies have documented that individuals with psychiatric disorders experience enormous disparities, rather than advantages, in quality of health services and achievement of expected screening, diagnostic, and treatment benchmarks.[21–27]

Several methodological limitations of this study should be acknowledged. First, CVD was ascertained by asking NESARC respondents whether they had ever been diagnosed with conditions that comprise CVD (arteriosclerosis, angina, or myocardial infarction) by a doctor. Presence of CVD was not confirmed with medical examination or review of health records. Classification accuracy using this method is generally good (as verified in several studies by review of medical records), and concerns about misclassification are primarily due to low sensitivity (ie, underreporting) rather than low specificity (ie, overreporting).[28–31] Nonetheless, the possibility of overreporting remains and cannot be ruled out. Second, despite the large sample size of the NESARC, only 96 adults with bipolar disorder developed CVD during the 3-year follow-up, thus precluding within-group analyses of predictors of CVD in this population. Third, the Wave 1 NESARC study did not include information regarding specific medications, dietary intake, glucose, lipids, and other biological factors such as inflammation and endothelial

dysfunction. Therefore, this study cannot address specific putative pathophysiologic or behavioral underpinnings of the observed associations.

Despite its limitations, this study demonstrates that bipolar disorder is associated with excessive risk of new-onset CVD, that this risk is of even larger magnitude than it is for MDD, and that this risk is not explained by traditional CVD risk factors such as cigarette smoking, obesity, and/or hypertension. In order to effect change, it will be important to ensure that preventive strategies are enacted. It is well known that there are disparities in the identification and treatment of CVD among persons with severe and persistent mental illnesses such as bipolar disorder. Smoking initiation rates are higher and cessation rates are vastly lower in bipolar disorder than in the general population,[32] underscoring the importance of providing individuals with bipolar disorder with access to smoking cessation counseling and treatment. In addition to other putative explanations for these disparities, such as stigma and concerns around competing clinical priorities among these complex patients, the early age at which CVD manifests itself among people with bipolar disorder should be taken into consideration when screening for and treating cardiovascular risk factors in this population. There are examples of successful integration of medical care with psychiatric care leading to improved outcomes,[33,34] and there are additional opportunities to provide community versions of these interventions so that all people with bipolar disorder have the potential to benefit from this holistic focus. Finally, there is mounting evidence regarding the association between cardiovascular risk and cognitive impairment in bipolar disorder.[35] Given that cardiovascular risk is associated with early morbidity and mortality, greater symptomatic burden, cognitive impairment, and increased costs, there are numerous reasons that assertive CVD prevention should be integrated as a core component in the treatment of bipolar disorder across the lifespan.

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Posttest

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1. In this study, cardiovascular disease (CVD) was considered present at follow-up if participants reported that a physician had diagnosed arteriosclerosis, angina, or myocardial infarction during the 3 years since baseline. The covariate-adjusted incidence of new-onset CVD was significantly greater among which group versus the other groups?

a. Bipolar disorder (BD)

b. Major depressive disorder (MDD)

c. Controls

d. The incidence of new-onset CVD was the same in all groups

2. Among participants in this study with new-onset CVD, how did their mean ages differ by group?

a. Those with BD-I were older than those with MDD or BD-II and controls

b. Those with BD-II were older than those with MDD or BD-I and controls

c. Those with MDD were older than those with BD-I or BD-II and controls

d. Controls were older than those with BD-I, BD-II, or MDD

3. In this study, group differences in incidence of new-onset CVD were explained by traditional risk factors such as smoking, hypertension, and obesity.

a. True

b. False

4. Mr A is 39 years old and has bipolar I disorder. You have been treating him for several years for his psychiatric problems only. Which health care strategy would be *least* helpful for Mr A?

a. Ask if he smokes, and, if so, recommend cessation counseling and treatment

b. Continue to focus on the mental disorder, but coordinate medical care with other providers

c. Mention the risk of future CVD, but tell him he's too young to do anything about it yet

d. Keep a scale in the office to track any weight gain, and encourage a healthy diet and exercise