Panic as an Independent Risk Factor for Suicide Attempt in Depressive Illness: Findings From the National Epidemiological Survey on Alcohol and Related Conditions (NESARC)

Curren Katz, MEd; Zimri S. Yaseen, MD; Ramin Mojtabai, MD, PhD, MPH; Lisa J. Cohen, PhD; and Igor I. Galynker, MD, PhD

ABSTRACT

Context: The relationship between comorbid panic and suicide in depressed persons remains unclear.

Objective: To examine the relationship of panic attacks and panic symptoms to suicidality in individuals with a major mood disorder meeting *DSM-IV* criteria for past-year major depressive episodes in a large epidemiologic study.

Method: In data on 2,679 community-dwelling participants of the National Epidemiologic Survey on Alcohol and Related Conditions (2001–2002) with major depressive episodes, the associations of panic attacks and panic symptoms with lifetime suicidal ideation and suicide attempts were assessed. The adjusted odds ratios (AORs) of suicidal ideation, suicide attempt, and suicide attempt among ideators for subjects with panic attacks were the primary outcome measures.

Results: Past-year panic attacks were associated with increased risk of lifetime suicidal ideations (AOR = 1.17; 95% CI, 1.02–1.35) and suicide attempts (AOR = 2.10; 95% CI, 1.77–2.50) and significantly increased risk of suicide attempts among those reporting suicidal ideations (AOR = 1.79; 95% CI, 1.49–2.15). Some panic symptoms, most notably catastrophic cognitions (fear of dying and fear of "losing control" or "going insane"), were more strongly and specifically associated with suicide attempt (AORs = 2.13–2.95), while others were more related to suicidal ideation.

Conclusions: Panic attacks appear to be an independent risk factor for suicide attempt among depressed individuals with and without suicidal ideation. Further, panic attacks, particularly those characterized by prominent catastrophic cognitions, may mediate the transition from suicidal ideations to suicide attempts in subjects with depressive episodes. Assessment of these symptoms may improve prediction of suicide attempts in clinical settings.

J Clin Psychiatry 2011;72(12):1628–1635

Submitted: *April 21, 2010; accepted July 7, 2010.*
Online ahead of print: *March 22, 2011 (doi:10.4088/JCP.10m06186blu).*
Corresponding author: *Zimri Yaseen, MD, Beth Israel Medical Center, Department of Psychiatry, First Ave and 16th St, New York, NY 10003 (zsyaseen@gmail.com).*

The major mood disorders are well established as risk factors for suicide.[1] However, most individuals with a major mood disorder do not attempt suicide.[2] Understanding the factors that lead a minority to do so may inform treatment and enhance suicide prevention. This article examines the possible role of panic attacks and individual panic symptoms as risk factors for suicidal ideation and behavior in individuals with depressive disorders.

Much research in the late 1980s and early 1990s focused on panic attacks[3] and panic disorder[4–8] as risk factors for suicidal ideations and suicide attempts. The seminal findings of Weissman et al[9] from the Epidemiologic Catchment Area study showed panic attacks and panic disorder to be associated with increased risk of both suicidal ideations and suicide attempts, even after controlling for major depression and substance abuse disorders. A number of studies in more recent years have examined these associations with mixed results for both panic disorder[10–15] and panic attacks.[16] Sareen et al[11] found significant associations between *DSM-III-R*–defined panic disorder and suicidal ideation and suicide attempt in a retrospective analysis of a large Dutch general population survey. By contrast, in a similar retrospective analysis of the US National Comorbidity Survey, Sareen et al[12] found no association between lifetime *DSM-III-R*–defined panic disorder and either suicidal ideation or suicide attempt.

Understanding what triggers suicidal ideators to act on their ideation is of critical importance because, despite the significant risk associated with suicide attempt, its predictability remains quite limited. Better understanding the role of panic attacks and, more importantly, specific panic symptoms in suicide attempts could potentially help in predicting and preventing suicide attempts.

To date, we know of only one large population-based study that has specifically examined the role of panic attacks or panic disorder in suicide attempts among individuals with suicidal ideations.[17] These authors examined the effect of panic disorder on suicide attempts among ideators in the National Comorbidity Survey Replication data, using retrospective age-at-onset reports. Using this methodology, they found that, among anxiety disorders, panic disorder, posttraumatic stress disorder (PTSD), and social phobias independently predicted both suicidal ideation and suicide attempt in the general population. Only PTSD predicted unplanned suicide attempts among ideators, and generalized anxiety disorder (GAD) and social phobia predicted planned suicide attempts among ideators. However, both panic disorder and GAD approached significance in predicting unplanned suicidal attempts among ideators. The authors concluded that suicide attempt was driven by anxiety and impulse control disorders, whereas depression itself primarily accounted for suicidal ideations. An important limitation of the study is the lack of control for *DSM-IV* personality disorders.

In the present study, we examine the association of panic attacks and individual panic symptoms with suicidality in depressed persons in a

large survey of the US general population. To this end, we analyze cross-sectional data from subjects meeting *DSM-IV-TR* criteria for major depressive episodes in the past year in the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC)—a nationally representative survey of the civilian, noninstitutionalized US general population.

In a previous analysis of NESARC, Bolton et al[18] found panic attacks to be associated with suicide attempts in women. We expand on the Bolton and colleagues'[18] study by examining the association of panic disorder and panic attacks with suicidal ideations as well as suicide attempts, examining association with specific panic symptoms, and adjusting the analyses for manic and hypomanic episodes in addition to other comorbidities and demographic variables. We further investigate the association of panic attacks and panic symptoms on transition from suicidal ideations to suicide attempts by examining the association of panic attacks and individual panic attack symptoms with suicide attempts among individuals reporting lifetime suicidal ideations.

METHOD

NESARC Survey

NESARC is a nationally representative survey of the civilian, noninstitutionalized US general population conducted by The National Institute on Alcohol Abuse and Alcoholism. The survey was administered in person to 43,093 US adults by experienced interviewers from the US Census Bureau in 2001–2002. The NESARC sampling frame entailed sampling 1 individual in each household. African Americans, Hispanics, and young adults, aged 18 to 24 years, were oversampled. The NESARC survey contained questions on respondents' past and present substance use disorders as well as questions on mood, anxiety, and selected personality disorders based on *DSM-IV* criteria.[19]

The research protocol, including informed consent procedures, received full ethical review and approval from the US Census Bureau and the US Office of Management and Budget. The analyses of deidentified public access data are exempt from institutional review board review. Further detailed information regarding the complex methodology used by NESARC is available elsewhere.[19,20]

Subjects

Of the 43,093 NESARC participants, 2,679 (6.2%) met criteria for past-year major depressive episodes and were included in our analysis.

Assessments

Lifetime suicidal ideation and suicide attempt. Our measure of lifetime suicidal ideation was based on 2 NESARC questions asking if the respondent had felt like he/she wanted to die or thought about committing suicide during a depressive episode. Subjects who responded positively to either of these variables were considered to have had suicidal ideation. Lifetime suicide attempt assessment was based on 1 question asking if the participant had attempted suicide when depressed.

Past-year panic attacks and panic symptoms. Psychiatric diagnoses in the NESARC survey were determined with the National Institute on Alcohol Abuse and Alcoholism (NIAAA) Alcohol Use Disorder and Associated Disabilities Interview Schedule-*DSM-IV* Version (AUDADIS-IV).[21] The NESARC survey methodology and psychometric properties of assessments have been previously documented.[22–24] Three NESARC items were used as screening variables for panic attacks: (1) "Had panic attack, suddenly felt frightened/overwhelmed/nervous as in great danger," (2) "Was surprised by panic attack that happened out of the blue, for no real reason, or in a situation where didn't expect to be frightened/nervous," and (3) "Thought was having heart attack but doctor said just nerves or panic attack." Participants who answered yes to at least 1 of these questions were then asked about 13 additional symptoms experienced during panic attacks based on the *DSM-IV* criteria. Respondents met criteria for a past-year panic attack if they had 3 or more of the 13 panic symptoms and they indicated that the only or most recent episode occurred in the past 12 months or that remission of the only or most recent episode was in the last 12 months.

Other past-year anxiety and mood disorders. Other anxiety and mood disorders included in the analyses to adjust for their effects included past-year social phobia, specific phobia, generalized anxiety disorder (GAD), and manic and hypomanic episodes. All diagnoses were made according to the NIAAA AUDADIS-IV.[21] Validity of these assessments against clinician-administered semistructured interviews has been previously reported.[20,22–25]

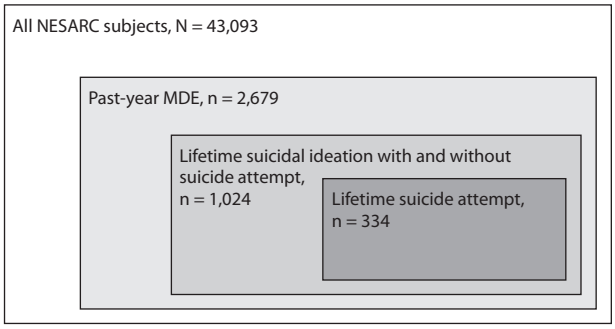
Past-year substance use disorders. Past-year illicit substance disorder use was based on NESARC diagnosis of abuse and/or dependence for the following substance categories: amphetamine, opioid, sedative, tranquilizer, cocaine, inhalant/solvent, hallucinogen, cannabis, heroin, and other drugs. Participants with abuse or dependence in the past year for at least 1 substance were coded as having an illicit substance disorder for our analysis. Alcohol abuse/dependence was assessed independently of illicit substance disorders. Respondents could have either or both substance disorder classifications.

Personality disorder. A selected group of personality disorders (avoidant, antisocial, dependant, histrionic, obsessive-compulsive, paranoid and schizoid personality disorders) were assessed in NESARC using the AUDADIS-IV.[26] Participants meeting criteria for at least 1 of these personality disorders were coded as having personality disorder in our analysis.

Statistical Analysis

In order to assess risk factors for suicidal ideations and suicide attempts, we performed a multinomial logistic regression analysis using 3 levels of suicidality as the dependent variable: (1) no ideation or attempt, (2) suicidal ideations only, and (3) suicide attempts (Figure 1). Independent variables

Figure 1. Sample Structure Venn Diagram (not drawn to scale)[a]



[a]Illustration of the sample structure of subjects selected for analysis from the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) database. Of 43,000 total subjects, approximately 2,700 reported past-year major depressive episode (MDE), and, of those, approximately 1,000 reported lifetime suicidal ideation with or without attempt. Within this group, approximately 300 reported lifetime suicide attempt. The single subject reporting suicide attempt without ideation was excluded from illustration for simplicity.

included history of panic attack as well as sociodemographic and comorbid clinical variables. Demographic variables included in the model were gender, age, race, education, urbanicity, and marital status, and the comorbid clinical variables were alcohol and illicit drug use disorders, personality disorder, manic or hypomanic episodes, social phobia, specific phobia, and generalized anxiety disorder (GAD). These clinical variables were chosen in light of numerous studies linking them to suicide risk.[11,27,28] Alcohol and substance use disorders have also been linked to panic disorder.[27]

For each demographic and clinical variable, the analyses produced adjusted odds ratios (AORs) for the suicidal ideation group versus nonsuicidal controls, suicide attempt group versus controls and suicide attempt versus suicidal ideation group. The adjusted odds ratios (AORs) of suicidal ideation, suicide attempt, and suicide attempt among ideators for subjects with panic attacks were the primary outcome measures. The regression coefficients of independent variables in comparisons of the suicidal ideation group versus the control group represent the association of these variables with suicidal ideations. Regression coefficients in the suicide attempt group versus control group comparisons represent the association with suicide attempts in the depressed population overall, whereas the regression coefficients in the suicide attempt group versus suicidal ideations group comparisons represent the association with suicide attempt among suicidal ideators, and thus reflect the effects of independent variables on the *transition* from suicidal ideation to suicide attempt.

To test the association between individual panic symptoms and suicidal ideation/suicide attempt, a second multinomial logistic regression was conducted, with the subjects reporting history of panic attacks (n = 633). The above 3 levels of suicidality were again used as the dependent variables. A separate model was run for each panic attack symptom. Additional independent variables entered into each model included the above comorbid clinical variables, gender, and age. The demographic variables were reduced in scope to increase the power of this subsample analysis.

Multinomial logistic regressions were performed using SPSS Complex Samples Logistic Regression module (SPSS Inc, Chicago, Illinois). Adjusted odds ratios (AORs) were calculated in SPSS with complex samples design, using normed weighted percentages.

Post hoc analysis comparing effect sizes of panic attacks with other clinical variables was performed two-by-two, using the conservative test of nonoverlap of 95% CIs as the criterion for significant difference.[29] Post hoc analysis comparing effect sizes of individual panic attack symptoms was performed in the same way.

RESULTS

Of 2,679 NESARC participants with major depressive episodes, 690 (26%) reported a lifetime history of suicidal ideation with no attempt (suicidal ideations group), 334 (12%) reported a history of suicide attempts (suicide attempt group), and 1,630 (61%) reported no history of either suicidal ideation or suicide attempt (nonsuicidal, depressed controls). Twenty-five participants (1%) had missing suicidality data. About one-quarter of our sample (n = 633, 23.6%) reported past-year panic attacks, while 2,046 (76.4%) did not. Only 1 respondent reported suicide attempt without suicidal ideation. The characteristics of subjects with past-year major depressive episodes with and without panic attack are presented in Table 1. The results regarding the effects of clinical and sociodemographic variables on suicidality are presented in Table 2 and summarized below. The results regarding the effects of individual panic attack symptoms on suicidality are presented in Table 3 and summarized following the results for panic attacks. Following the convention of Davies et al,[30] statistically significant AORs near 2 or greater are described as strong associations, while those greater than but closer to 1 are described as weak.

Association of Lifetime Suicidality and Past-Year Panic Attacks

The association of panic attacks and lifetime suicidal ideations was relatively small (AOR = 1.2; 95% CI, 1.0–1.4), but the association of panic attacks and lifetime suicide attempt compared to both controls and ideators was nearly twice as strong (suicide attempt vs suicidal ideations, AOR = 1.8; 95% CI, 1.5–2.2). Thus, panic appeared to be more strongly associated with suicide attempt than with suicidal ideations in the NESARC sample of depressed subjects.

In post hoc analysis, the effect of panic attacks on lifetime suicidality was compared with the effects of other clinical variables. Panic attacks were less strongly associated with suicidal ideations compared to controls than were manic episodes and personality disorder, and did not differ significantly from social phobia, illicit substance, or alcohol use disorders, in their association with suicidal ideations. In contrast, the association of panic attack with suicide attempt

Table 1. Sociodemographic Characteristics and Comorbidities for All Subjects With Major Depressive Episode (MDE) With and Without Panic Attacks in NESARC

	All MDE, n = 2,679			MDE With Panic Attacks, n = 633		MDE Without Panic Attacks, n = 2,046	
Variable	n	%	%, Weighted	n	%	n	%
Gender							
Male	822	30.7	34.4	156	24.6	666	32.6
Female	1,857	69.3	65.6	477	75.4	1,380	67.4
Age, y							
18–29	795	29.7	31.5	163	25.8	632	30.9
30–44	857	32.0	30.8	234	37.0	623	30.4
45–64	772	28.8	29.7	208	32.9	564	27.6
≥ 65	255	9.5	7.9	28	4.4	227	11.1
Race or ethnicity							
White	1,654	61.7	76.4	431	68.1	1,223	59.8
Hispanic/Latino	625	17.9	9.1	102	16.1	392	19.2
Black	459	17.1	10.6	87	13.7	372	18.2
Other	96	3.6	4.6	19	3.0	77	3.8
Education, y							
0–11	525	19.6	18.3	117	18.5	408	19.9
12	793	29.6	29.8	191	30.2	602	29.4
13–15	840	31.4	31.6	210	33.2	630	30.8
≥ 16	521	19.4	20.3	115	18.2	406	19.8
Urbanicity							
Urban	1,002	37.4	30.9	239	37.8	763	37.3
Suburban	1,146	42.8	45.9	253	40.0	893	43.6
Rural	531	19.8	23.2	141	22.3	390	19.1
Marital status							
Married	1,028	38.4	47.9	245	38.7	783	38.3
Not married	1,651	61.6	52.1	388	61.3	1,263	61.7
Comorbid disorders							
Illicit substance disorder	174	6.5	6.5	52	8.2	122	6.0
Alcohol disorder	496	18.5	19.0	132	20.9	364	17.8
Personality disorder	1,113	41.5	41.9	389	61.5	724	35.4
Manic episode	323	12.1	12.2	153	24.2	170	8.3
Hypomanic episode	122	4.6	4.8	31	4.9	91	4.4
Social phobia	278	10.4	11.0	151	23.9	127	6.2
Specific phobia	478	17.8	17.9	204	32.2	274	13.4
Generalized anxiety disorder	431	16.1	16.6	210	33.2	221	10.8

Abbreviation: NESARC = National Epidemiologic Survey on Alcohol and Related Conditions.

compared to controls was significantly stronger than for all other disorders, except manic episodes, personality disorder, and social phobia, for which no significant differences were found. Likewise, the association of panic attack with suicide attempt among ideators (suicide attempt vs suicidal ideation) was significantly stronger than for all disorders, except manic episodes, personality disorder, and specific phobia, for which no significant differences were found (see Table 2).

Association of Lifetime Suicidality With Individual Past-Year Panic Attack Symptoms

Almost all panic symptoms were associated with suicide attempt compared to controls at a statistically significant level (Table 3). For suicidal ideations (suicidal ideations vs controls) and for suicide attempt among ideators (suicide attempt vs suicidal ideation), however, differences were found between different symptoms.

Adjusted odds ratios for different panic symptoms were compared in post hoc analyses. The "catastrophic cognitions"[31,32] of panic attacks (ie, "felt might die/go crazy") presented strong associations with suicidality. "Felt might die" was strongly associated with suicide attempt compared to controls and to ideators (suicide attempt vs suicidal ideation), (AOR = 2.95 [95% CI, 2.4–3.7] and AOR = 2.5 [95% CI, 2.0–3.1], respectively) as was "Felt might go crazy, lose control" (AOR = 2.5; [95% CI, 2.1–3.0] and AOR = 2.1 [95% CI, 1.7–2.7], respectively). Neither symptom was associated significantly with suicidal ideations. Moreover, the cognitive symptoms of fears of death and of losing control had significantly stronger associations with suicide attempt among ideators (suicide attempt vs suicidal ideation) than did dissociation, choking sensations, and chest pains.

Dissociation ("Things around seemed unreal, felt detached from things around") was strongly associated with suicidal ideations (AOR = 1.8; 95% CI, 1.5–2.2) and with suicide attempt compared to controls (AOR = 2.3; 95% CI, 1.9–2.8) but was not associated at a statistically significant level with suicide attempt among ideators. Dissociation was more strongly associated with suicidal ideations than were all other panic symptoms except trembling, choking, and chest pain.

The somatic symptoms of dizziness or lightheadedness, perspiration, hot-flashes or chills, shortness of breath, and tingling or numbness all had significant association with suicide attempt compared to controls and to ideators (with AORs ranging from 1.4 to 2.1, 95% CIs from a lower limit of 1.2–1.6 to an upper limit of 1.7–2.8). The somatic symptoms of trembling, choking, and chest pain were all associated at a statistically significant level with suicidal ideation and suicide attempt compared to controls (with AORs ranging from 1.4 to 2.1, 95% CIs from a lower limit of 1.1–1.6 to an upper limit of 1.7–2.7) but were not significantly associated with suicide attempt compared to ideators.

Association of Lifetime Suicidality and Other Clinical Variables

Among all clinical variables, past-year panic attacks, past-year manic episode, and personality disorder were the only ones that were significantly associated with suicidal ideation, suicide attempt, and suicide attempt among ideators.

Among anxiety disorders other than panic attacks, past-year GAD was not significantly associated with suicidality (suicidal ideation vs controls, suicide attempt vs controls, suicide attempt vs suicidal ideation). Past-year social phobia was associated with suicidal ideation and suicide attempt when compared to controls but not with suicide attempt among ideators, and past-year specific phobia showed discrepant effects, appearing to have a protective effect against suicidal ideations (AOR = 0.8; 95% CI, 0.7–0.9), to have no association with suicide attempt in comparison to controls,

Table 2. Association of Clinical and Sociodemographic Variables With Suicidal Ideation and Suicide Attempts in NESARC Participants With Major Depressive Episodes[a]

Variable	Suicidal Ideation Only (n = 690) Versus No Suicidal Ideation and No Suicide Attempt (n = 1,630), AOR (95% CI)	Suicide Attempt (n = 334) Versus No Suicidal Ideation and No Suicide Attempt (n = 1,630), AOR (95% CI)	Suicide Attempt (n = 334) Versus Suicidal Ideation Only (n = 690), AOR (95% CI)
Psychiatric disorders			
Panic attack	**1.17** (1.02–1.35)	**2.10** (1.77–2.50)	**1.79** (1.49–2.15)
Manic episode	**1.66** (1.39–1.97)	**2.86** (2.32–3.53)	**1.73** (1.36–2.20)
Hypomanic episode	1.07 (0.79–1.44)	1.05 (0.72–1.53)	0.98 (0.68–1.43)
Specific phobia	**0.79** (0.67–0.92)	1.19 (1.00–1.43)	**1.52** (1.28–1.81)
Social phobia	**1.41** (1.16–1.73)	**1.67** (1.33–2.09)	1.18 (0.95–1.48)
Generalized anxiety disorder	1.18 (0.97–1.43)	0.92 (0.73–1.15)	0.78 (0.60–1.00)
Personality disorder	**2.18** (1.91–2.48)	**2.95** (2.46–3.55)	**1.36** (1.11–1.66)
Illicit substance disorder	**1.54** (1.19–1.98)	1.39 (0.96–2.01)	0.90 (0.64–1.27)
Alcohol disorder	**1.24** (1.02–1.51)	**1.35** (1.08–1.68)	1.09 (0.87–1.35)
Sociodemographic characteristics			
Gender (female vs male)			
Male (reference)	1	1	1
Female	**0.82** (0.71–0.93)	0.98 (0.79–1.20)	1.20 (0.96–1.50)
Race or ethnicity			
Black	1.22 (0.94–1.59)	1.20 (0.57–2.53)	0.98 (0.39–2.44)
Hispanic/Latino	1.02 (0.80–1.31)	1.22 (0.58–2.57)	1.19 (0.50–2.83)
White	**1.31** (1.04–1.66)	1.02 (0.48–2.19)	0.78 (0.33–1.83)
Other	1.19 (0.87–1.63)	**2.08** (1.02–4.22)	1.74 (0.76–4.01)
Age, y			
18–29 (reference)	1	1	1
30–44	**0.73** (0.63–0.85)	**0.76** (0.60–0.96)	1.04 (0.81–1.34)
45–64	1.06 (0.89–1.27)	**0.67** (0.51–0.87)	**0.63** (0.48–0.82)
> 64	**0.75** (0.61–0.92)	**0.13** (0.08–0.22)	**0.18** (0.11–0.29)
Education, y			
0–11 (reference)	1	1	1
12	**1.42** (1.20–1.68)	**0.70** (0.51–0.96)	**0.49** (0.35–0.68)
13–15	**1.26** (1.04–1.53)	0.95 (0.69–1.29)	0.75 (0.54–1.04)
≥ 16	**1.58** (1.29–1.94)	**0.63** (0.46–0.86)	**0.40** (0.29–0.56)
Urbanicity			
Rural (reference)	1	1	1
Urban	0.98 (0.77–1.24)	0.94 (0.69–1.28)	0.96 (0.71–1.29)
Suburban	0.83 (0.66–1.06)	0.81 (0.59–1.10)	0.97 (0.71–1.30)
Marital status			
Not married (reference)	1	1	1
Married	**0.13** (0.08–0.22)	**0.79** (0.65–0.95)	0.91 (0.74–1.12)

[a]Multiple logistic regression model using weighted percentages and adjusted for gender, race/ethnicity, age, education, urbanicity, marital status, and comorbid psychiatric disorders (past-year panic attack, past-year manic episode, past-year hypomanic episode, past-year specific phobia, past-year social phobia, past-year generalized anxiety disorder, past-year alcohol use disorder, past-year illicit substance use disorder, personality disorder). Entries in bold are significant, with 2-tailed $P < .05$.

Abbreviations: AOR = adjusted odds ratio, NESARC = National Epidemiologic Survey on Alcohol and Related Conditions.

Table 3. Association of Individual Panic Attack Symptoms With Suicidal Ideation and Suicide Attempts in NESARC Participants With Major Depressive Episodes[a]

Panic Attack Symptom	Suicidal Ideation Only (n = 690) Versus No Suicidal Ideation and No Suicide Attempt (n = 1,630), AOR (95% CI)	Suicide Attempt (n = 334) Versus No Suicidal Ideation and No Suicide Attempt (n = 1,630), AOR (95% CI)	Suicide Attempt (n = 334) Versus Suicidal Ideation Only (n = 690), AOR (95% CI)
Felt might die	1.18 (0.98–1.42)	**2.95** (2.39–3.65)	**2.50** (2.05–3.05)
Felt might go crazy, lose control	1.18 (1.00–1.39)	**2.50** (2.07–3.01)	**2.13** (1.66–2.72)
Dizzy, lightheaded, as if might faint	0.97 (0.77–1.22)	**1.92** (1.58–2.33)	**1.99** (1.58–2.50)
Heart racing, pounding, or skipping	0.68 (0.43–1.08)	1.31 (0.91–1.89)	**1.94** (1.30–2.89)
Perspired or sweated	1.10 (0.87–1.39)	**2.10** (1.58–2.79)	**1.91** (1.42–2.58)
Flushes, hot flashes, or chills	**0.78** (0.65–0.95)	**1.41** (1.17–1.71)	**1.81** (1.44–2.27)
Trouble catching breath, short of breath, felt like smothering	1.02 (0.82–1.26)	**1.72** (1.25–2.37)	**1.69** (1.26–2.25)
Tingling or numbness	1.17 (0.98–1.41)	**1.89** (1.52–2.35)	**1.61** (1.29–2.01)
Trembled or shook	**1.45** (1.09–1.93)	**2.07** (1.57–2.73)	1.43 (0.96–2.12)
Nauseated, upset stomach, felt might vomit or have diarrhea	1.16 (0.99–1.37)	**1.55** (1.23–1.95)	1.33 (0.99–1.78)
Things around seemed unreal/felt detached from things around	**1.79** (1.48–2.17)	**2.28** (1.86–2.80)	1.27 (0.99–1.64)
Felt as if choking	**1.41** (1.16–1.72)	**1.64** (1.29–2.07)	1.16 (0.90–1.51)
Pain or pressure in chest	**1.52** (1.25–1.84)	**1.64** (1.31–2.05)	1.08 (0.86–1.36)

[a]Multiple logistic regression model using weighted percentages and adjusted for sex, age, personality disorder, alcohol disorder, illicit substance disorder, manic episode, hypomanic episode, social phobia, specific phobia, and generalized anxiety disorder. Entries in bold are significant, with 2-tailed $P < .05$.

Abbreviations: AOR = adjusted odds ratio, NESARC = National Epidemiologic Survey on Alcohol and Related Conditions.

and to be moderately associated with suicide attempt among ideators (AOR = 1.5; 95% CI, 1.3–1.8).

DISCUSSION

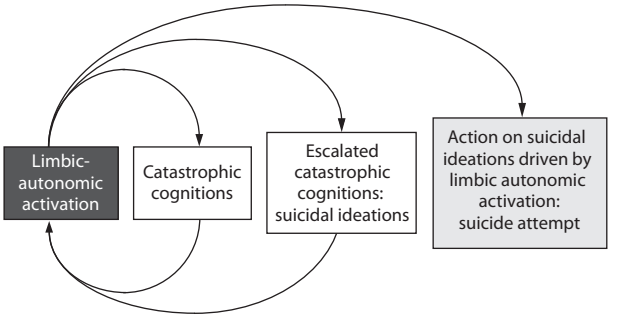
The present study examined the association of past-year panic attacks and individual panic symptoms with lifetime suicidal ideation and suicide attempts in a sample of individuals with depression in the general population. To our knowledge, this is the first large US population-based study to examine the association of individual panic attack symptoms with suicidality in a depressed population. Moreover, this is 1 of only 2 large population-based studies[11,17] to specifically examine the association between panic attacks and suicide attempt among suicide ideators, and 1 of very few such studies to examine the association between panic attacks and suicidality in subjects with depression using *DSM-IV* diagnostic criteria. As such, it provides data that may inform future research as well as treatment and prevention strategies.

There were 2 primary findings in this study. First, past-year history of panic attacks was significantly associated with a lifetime history of suicidal ideation, suicide attempts, and suicide attempts among ideators, even after controlling for sociodemographic and comorbid clinical variables. However, panic appeared to be more strongly associated with suicide attempt itself than with suicidal ideation and therefore may represent a factor mediating the transition from suicidal ideation to suicide attempt in depressed subjects. The association between panic attack and suicide attempts among ideators was statistically stronger than it was for suicide attempts among ideators and alcohol and substance use disorders, social phobia, GAD, or hypomanic episodes. Thus, our findings suggest that panic may distinguish suicide ideators at a higher risk for carrying out a suicide attempt.

Second, while almost all panic attack symptoms were associated with suicide attempt compared to controls, for some panic attack symptoms, this relation appeared attributable to their association with suicidal ideations, while others were more strongly and specifically associated with suicide attempt itself and did not associate significantly with suicidal ideations. Specifically, among suicide ideators, catastrophic cognitions (fears of dying and of losing control or going insane) had a significantly stronger association with suicide attempt than did dissociation, choking sensations, and chest pain. In contrast, dissociation, choking sensations, and chest pain were most strongly associated with suicidal ideations and were associated significantly with suicide attempt compared to controls but not with suicide attempt among ideators. This finding suggests that specific symptoms of panic are differentially associated with the transition from suicidal ideation to suicide attempt and that the presence of panic-associated catastrophic cognitions may specifically distinguish ideators at higher risk for suicide attempt.

The association of panic attacks with suicidal ideation and suicide attempt in this study is consistent with other studies finding a similar association between suicidality and panic attack[3,9] and panic disorder[9,11,17] and is in line with Nock and colleagues'[17] analysis of the National Comorbidity Survey Replication cohort vis-à-vis panic disorder. This holds for the specific finding of stronger association of panic attacks with suicide attempt than with suicidal ideations and the roughly 2-fold increased odds for suicide attempt among ideators with panic attacks.

Figure 2. Positive Feedback Model for Suicide[a]



[a]In the positive-feedback model for the triggering of suicide attempt, limbic-autonomic arousal and catastrophic cognitions of panic attack are mutually activating (left-most cycle). With this positive feedback, catastrophic cognitions are amplified, producing suicidal ideation (middle cycle). In the final semicycle, the combination of suicidal ideation and heightened limbic-autonomic arousal drives the transition to action in the form of suicide attempt.

These findings may be understood in the context of a proposed positive-feedback model of suicidality (Figure 2). Although preliminary, this model of trait susceptibility to hyperarousal is consistent with Meller and colleagues' finding[33] of hypothalimic-pituitary-adrenal axis dysregulation in anxious depressives compared to nonanxious depressives and normal controls. The model builds on Barlow's influential model[34] of panic attacks, which posits positive feedback between physiologic arousal symptoms and negative cognitions; the work of Hinton and colleagues[35] extending Barlow's model to PTSD; and research on anxiety sensitivity, which links a trait susceptibility to such positive feedback systems to both panic attacks[36] and suicide attempts.[37]

Specifically, we found that the panic attacks characterized by catastrophic cognitions were those most strongly associated with suicide attempt among ideators. We thus speculate that the emergence of catastrophic cognitions in panic attack indicates a specific susceptibility to the activation of suicidal ideations and related negative cognitions, such as worthlessness or ideas of guilt,[18,38] in the positive feedback model. The combination of high limbic autonomic arousal (in clinical terms, the fight/flight response associated with panic) with activated suicidal ideations may then drive the transition from ideation to action in the form of a suicide attempt.

This model is consistent with the findings of Schnyder and colleagues,[39] who observed that feelings of panic and "loss of control" were frequently reported to immediately precede suicide attempt in patients presenting to the emergency room after a nonlethal attempt and the finding of Deisenhammer et al[40] that the average interval between suicidal ideation and suicide attempt is a mere 10 minutes. Such impulsivity in suicidal behavior might be understood in light

of the acuity of the panic state and the accelerative nature of positive feedback mechanisms.

In sum, our results may reflect a crucial role for panic attack or a panic-related state in mediating the transition from suicidal ideation to impulsive suicidal action. Such a connection may have significant clinical implications, both for the assessment of acute suicide risk and for its treatment. Assessment of suicide risk in the clinical setting may be meaningfully improved by assessment of specific panic symptoms. Furthermore, pharmacologic therapy as well as cognitive-therapeutic approaches might be specifically targeted to disrupt proposed suicide-generating cognitive-limbic/autonomic feedback loops.[41–46]

Limitations

The results of this study should be viewed in the context of a number of limitations. First, the assessments were retrospective and detailed chronological data were unavailable. Further, we were limited by considerations of statistical power to comparison of lifetime suicidality with past-year symptomatology. Thus, strong causal links between panic and suicidal behavior cannot be inferred. Second, all assessments were based on self-report, and thus subject to a variety of potential biases, including recall bias. In addition, diagnoses may not be as accurate as those made clinically. Third, the sample included bipolar subjects with past-year depressive episodes. It remains to be determined how the presence of panic states might affect suicidality differently in persons with unipolar versus bipolar types of depression. Fourth, both active and passive thoughts of death or dying were classified as suicidal ideation. Similarly, information regarding the gravity of suicide attempt was not collected, and completed suicides were not included. In addition, parasuicidal behavior (eg, intentional medication overdose), which may result in significant morbidity, may not have been reported as suicide attempt because respondents may not have considered themselves to have been attempting to end their lives.

CONCLUSIONS

Past-year history of panic attacks was significantly associated with a lifetime history of suicidal ideation, suicide attempts, and suicide attempts among ideators. The association with panic attack was stronger for suicide attempt than for suicide ideation. Some panic attack symptoms, most notably catastrophic cognitions, were more strongly and specifically associated with suicide attempt, while others were more related to suicidal ideations. Our findings suggest that, along with personality disorder and bipolar I disorder, panic attacks are an independent risk factor for suicide attempt among depressed individuals with and without suicidal ideation. Further, panic attacks, particularly those characterized by prominent catastrophic cognitions, may mediate the transition from suicidal ideations to suicide attempts in depressed subjects. Assessment of these symptoms may distinguish suicide ideators at a higher risk for carrying out a suicide attempt and may thus aid in the assessment of acute suicide risk and its prevention, which remain unresolved and vexing clinical problems.

Author affiliations: Departments of Psychiatry (Dr Yaseen) and Biological Psychiatry (Drs Cohen and Galynker and Ms Katz), Beth Israel Medical Center, New York, New York; and Department of Psychiatry, Bloomberg School of Public Health, Johns Hopkins University (Dr Mojtabai), Baltimore, Maryland.
Potential conflicts of interest: **Dr Cohen** has received grant/research support from Bristol-Myers Squibb and AstraZeneca. **Dr Galynker** has received grants from AstraZeneca and Pfizer. **Drs Yaseen** and **Mojtabai** and **Ms Katz** report no potential conflicts of interest relevant to the subject of this article.
Funding/support: This study was supported in part by the Hope for Depression Research Foundation.
Previous presentation: Portions of this study were presented as a poster at the 162nd Annual Meeting of the American Psychiatric Association; May 16–21, 2009; San Francisco, California.

REFERENCES

1. Kessler RC, Borges G, Walters EE. Prevalence of and risk factors for lifetime suicide attempts in the National Comorbidity Survey. *Arch Gen Psychiatry*. 1999;56(7):617–626.
2. Bostwick JM, Pankratz VS. Affective disorders and suicide risk: a reexamination. *Am J Psychiatry*. 2000;157(12):1925–1932.
3. Fawcett J, Scheftner WA, Fogg L, et al. Time-related predictors of suicide in major affective disorder. *Am J Psychiatry*. 1990;147(9):1189–1194.
4. Markowitz JS, Weissman MM, Ouellette R, et al. Quality of life in panic disorder. *Arch Gen Psychiatry*. 1989;46(11):984–992.
5. Johnson J, Weissman MM, Klerman GL. Panic disorder, comorbidity, and suicide attempts. *Arch Gen Psychiatry*. 1990;47(9):805–808.
6. Friedman S, Jones JC, Chernen L, et al. Suicidal ideation and suicide attempts among patients with panic disorder: a survey of two outpatient clinics. *Am J Psychiatry*. 1992;149(5):680–685.
7. Cox BJ, Direnfeld DM, Swinson RP, et al. Suicidal ideation and suicide attempts in panic disorder and social phobia. *Am J Psychiatry*. 1994; 151(6):882–887.
8. Fleet RP, Dupuis G, Marchand A, et al. Panic disorder in emergency department chest pain patients: prevalence, comorbidity, suicidal ideation, and physician recognition. *Am J Med*. 1996;101(4):371–380.
9. Weissman MM, Klerman GL, Markowitz JS, et al. Suicidal ideation and suicide attempts in panic disorder and attacks. *N Engl J Med*. 1989; 321(18):1209–1214.
10. Bolton JM, Cox BJ, Afifi TO, et al. Anxiety disorders and risk for suicide attempts: findings from the Baltimore Epidemiologic Catchment area follow-up study. *Depress Anxiety*. 2008;25(6):477–481.
11. Sareen J, Cox BJ, Afifi TO, et al. Anxiety disorders and risk for suicidal ideation and suicide attempts: a population-based longitudinal study of adults. *Arch Gen Psychiatry*. 2005;62(11):1249–1257.
12. Sareen J, Houlahan T, Cox BJ, et al. Anxiety disorders associated with suicidal ideation and suicide attempts in the National Comorbidity Survey. *J Nerv Ment Dis*. 2005;193(7):450–454.
13. Beck AT, Steer RA, Sanderson WC, et al. Panic disorder and suicidal ideation and behavior: discrepant findings in psychiatric outpatients. *Am J Psychiatry*. 1991;148(9):1195–1199.
14. Rudd MD, Dahm PF, Rajab MH. Diagnostic comorbidity in persons with suicidal ideation and behavior. *Am J Psychiatry*. 1993;150(6):928–934.
15. Warshaw MG, Dolan RT, Keller MB. Suicidal behavior in patients with current or past panic disorder: five years of prospective data from the Harvard/Brown Anxiety Research Program. *Am J Psychiatry*. 2000; 157(11):1876–1878.
16. Placidi GP, Oquendo MA, Malone KM, et al. Anxiety in major depression: relationship to suicide attempts. *Am J Psychiatry*. 2000;157(10): 1614–1618.
17. Nock MK, Hwang I, Sampson NA, et al. Mental disorders, comorbidity and suicidal behavior: results from the National Comorbidity Survey Replication. *Mol Psychiatry*. 2010;15(8):868–876.
18. Bolton JM, Belik SL, Enns MW, et al. Exploring the correlates of suicide attempts among individuals with major depressive disorder: findings from the national epidemiologic survey on alcohol and related conditions. *J Clin Psychiatry*. 2008;69(7):1139–1149.
19. Grant BF, Dawson DA. Introduction to the National Epidemiological Survey on Alcohol and Related Conditions.

 © Copyright 2011 Physicians Postgraduate Press, Inc.

Alcohol Res Health. 2006;29(2):74–78. http://pubs.niaaa.nih.gov/publications/arh29-2/74-78.pdf
20. Grant BF, Dawson DA, Stinson FS, et al. The Alcohol Use Disorder and Associated Disabilities Interview Schedule-IV (AUDADIS-IV): reliability of alcohol consumption, tobacco use, family history of depression and psychiatric diagnostic modules in a general population sample. *Drug Alcohol Depend*. 2003;71(1):7–16.
21. Grant BF, Dawson DA, Hasin DS. *The Alcohol Use Disorder and Associated Disabilities Interview Schedule–DSM–IV Version*. Bethesda, MD: National Institute on Alcohol Abuse and Alcoholism; 2001.
22. Canino GJ, Bravo M, Ramírez R, et al. The Spanish Alcohol Use Disorder and Associated Disabilities Interview Schedule (AUDADIS): reliability and concordance with clinical diagnoses in a Hispanic population. *J Stud Alcohol*. 1999;60(6):790–799.
23. Chatterji S, Saunders JB, Vrasti R, et al. Reliability of the alcohol and drug modules of the Alcohol Use Disorder and Associated Disabilities Interview Schedule—alcohol/drug-revised (AUDADIS-ADR): an international comparison. *Drug Alcohol Depend*. 1997;47(3):171–185.
24. Grant BF, Harford TC, Dawson DA, et al. The Alcohol Use Disorder and Associated Disabilities Interview schedule (AUDADIS): reliability of alcohol and drug modules in a general population sample. *Drug Alcohol Depend*. 1995;39(1):37–44.
25. Ruan WJ, Goldstein RB, Chou SP, et al. The alcohol use disorder and associated disabilities interview schedule-IV (AUDADIS-IV): reliability of new psychiatric diagnostic modules and risk factors in a general population sample. *Drug Alcohol Depend*. 2008;92(1–3):27–36.
26. Grant BF, Hasin DS, Stinson FS, et al. Prevalence, correlates, and disability of personality disorders in the United States: results from the national epidemiologic survey on alcohol and related conditions. *J Clin Psychiatry*. 2004;65(7):948–958.
27. Tidemalm D, Långström N, Lichtenstein P, et al. Risk of suicide after suicide attempt according to coexisting psychiatric disorder: Swedish cohort study with long term follow-up. *BMJ*. 2008;337(nov18 3):a2205.
28. Diefenbach GJ, Woolley SB, Goethe JW. The association between self-reported anxiety symptoms and suicidality. *J Nerv Ment Dis*. 2009; 197(2):92–97.
29. Payton ME, Greenstone MH, Schenker N. Overlapping confidence intervals or standard error intervals: what do they mean in terms of statistical significance? *J Insect Sci*. 2003;3:34.
30. Davies HT, Crombie IK, Tavakoli M. When can odds ratios mislead? *BMJ*. 1998;316(7136):989–991.
31. Hinton DE, Pollack MH. Introduction to the special issue: anxiety disorders in cross-cultural perspective. *CNS Neurosci Ther*. 2009;15(3):207–209.
32. Breitholtz E, Johansson B, Ost LG. Cognitions in generalized anxiety disorder and panic disorder patients: a prospective approach. *Behav Res Ther*. 1999;37(6):533–544.
33. Meller WH, Kathol RG, Samuelson SD, et al. CRH challenge test in anxious depression. *Biol Psychiatry*. 1995;37(6):376–382.
34. Barlow DH. *Anxiety and Its Disorders: The Nature and Treatment of Anxiety and Panic*. 2nd ed. New York, NY: Guilford Press; 2002.
35. Hinton DE, Hofmann SG, Pitman RK, et al. The panic attack-posttraumatic stress disorder model: applicability to orthostatic panic among Cambodian refugees. *Cogn Behav Ther*. 2008;37(2):101–116.
36. Taylor S, Koch WJ, Woody S, et al. Anxiety sensitivity and depression: how are they related? *J Abnorm Psychol*. 1996;105(3):474–479.
37. McNally RJ. Anxiety sensitivity and panic disorder. *Biol Psychiatry*. 2002; 52(10):938–946.
38. McGirr A, Renaud J, Seguin M, et al. An examination of *DSM-IV* depressive symptoms and risk for suicide completion in major depressive disorder: a psychological autopsy study. *J Affect Disord*. 2007;97(1–3): 203–209.
39. Schnyder U, Valach L, Bichsel K, et al. Attempted suicide: do we understand the patients' reasons? *Gen Hosp Psychiatry*. 1999;21(1):62–69.
40. Deisenhammer EA, Ing CM, Strauss R, et al. The duration of the suicidal process: how much time is left for intervention between consideration and accomplishment of a suicide attempt? *J Clin Psychiatry*. 2009;70(1):19–24.
41. Meltzer HY. Suicide and schizophrenia: clozapine and the InterSePT study. International Clozaril/Leponex Suicide Prevention Trial. *J Clin Psychiatry*. 1999;60(suppl 12):47–50.
42. Meltzer HY, Alphs L, Green AI, et al; International Suicide Prevention Trial Study Group. Clozapine treatment for suicidality in schizophrenia: International Suicide Prevention Trial (InterSePT). *Arch Gen Psychiatry*. 2003;60(1):82–91.
43. Baldessarini RJ, Huston-Lyons D, Campbell A, et al. Do central anti-adrenergic actions contribute to the atypical properties of clozapine? *Br J Psychiatry suppl*. 1992;(17):12–16.
44. De Paermentier F, Mauger JM, Lowther S, et al. Brain alpha-adrenoceptors in depressed suicides. *Brain Res*. 1997;757(1):60–68.
45. Glick ID, Zaninelli R, Hsu C, et al. Patterns of concomitant psychotropic medication use during a 2-year study comparing clozapine and olanzapine for the prevention of suicidal behavior. *J Clin Psychiatry*. 2004;65(5): 679–685.
46. González-Maeso J, Rodríguez-Puertas R, Meana JJ, et al. Neurotransmitter receptor-mediated activation of G-proteins in brains of suicide victims with mood disorders: selective supersensitivity of alpha(2A)-adrenoceptors. *Mol Psychiatry*. 2002;7(7):755–767.