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History of suicide attempts in pediatric bipolar disorder: factors associated with increased risk

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Abstract

Background—Despite evidence indicating high morbidity associated with pediatric bipolar disorder (BP), little is known about the prevalence and clinical correlates of suicidal behavior among this population.

Objective—To investigate the prevalence of suicidal behavior among children and adolescents with BP, and to compare subjects with a history of suicide attempt to those without on demographic, clinical, and familial risk factors.

Methods—Subjects were 405 children and adolescents aged 7–17 years, who fulfilled DSM-IV criteria for BPI (n = 236) or BPII (n = 29), or operationalized criteria for BP not otherwise specified (BP NOS; n = 140) via the Schedule for Affective Disorders and Schizophrenia for School-Aged Children. As part of a multi-site longitudinal study of pediatric BP (Course and Outcome of Bipolar Youth), demographic, clinical, and family history variables were measured at intake via clinical interview with the subject and a parent/guardian.

Results—Nearly one-third of BP patients had a lifetime history of suicide attempt. Attempters, compared with non-attempters, were older, and more likely to have a lifetime history of mixed episodes, psychotic features, and BPI. Attempters were more likely to have a lifetime history of comorbid substance use disorder, panic disorder, non-suicidal self-injurious behavior, family history of suicide attempt, history of hospitalization, and history of physical and/or sexual abuse. Multivariate analysis found that the following were the most robust set of predictors for suicide attempt: mixed episodes, psychosis, hospitalization, self-injurious behavior, panic disorder, and substance use disorder.

Conclusions—These findings indicate that children and adolescents with BP exhibit high rates of suicidal behavior, with more severe features of BP illness and comorbidity increasing the risk for suicide attempt. Multiple clinical factors emerged distinguishing suicide attempters from non-attempters. These clinical factors should be considered in both assessment and treatment of pediatric BP.

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Keywords

pediatric bipolar disorder; risk factors; suicide; suicide attempt

Risk for completed suicide in bipolar disorder (BP) is among the highest of all psychiatric disorders (1); between 25% and 50% of adult patients with BP make at least one suicide attempt in their lifetime, and between 8% and 19% of BP patients will die from suicide (2). Research indicates that between 20% and 65% of adults with BP experience onset in childhood (3, 4), and those adults with early illness onset are at higher risk for suicidal behavior (4, 5). Only in the last decade has there been increasing recognition, diagnosis, and treatment of BP in pediatric populations. Given the relative infancy of the field, it is not surprising that little is known about suicidal behavior in pediatric BP despite the apparent link between early illness onset and suicidality.

Evidence from case-control studies of adolescent suicide victims indicates that BP in adolescence imparts a particularly elevated risk for completed suicide (6, 7). Furthermore, reports from two longitudinal studies support significant mortality from suicide among pediatric BP patients. Srinath et al. (8) reported a 3% suicide rate among pediatric BPI patients 5 years after index episode hospitalization, whereas Welner et al. (9) documented a 25% suicide completion rate among a BP adolescent inpatient sample (when compared with 6% among unipolar patients) at 10-year follow up.

To date, few studies have examined suicidal behavior among BP children and adolescents. Strober et al. (10) reported medically significant suicide attempts in 20% of an adolescent BPI sample over 5-year follow up. Lewinsohn et al. (11) reported a 44% lifetime suicide attempt rate among adolescents with BP spectrum disorders – significantly elevated when compared with 22% of unipolar (UP) depressed teens and 1% of healthy controls. In this sample, BP attempters (when compared with UP attempters) were younger at first attempt, made more lethal attempts, and were more likely to make multiple attempts. Bhangoo et al. (12) reported a 47% attempt rate among BPI children and adolescents with an episodic pattern of mood symptomatology (one or more DSM-IV manic or hypomanic episodes), when compared with a 15% attempt rate for those patients with a chronic illness pattern (no discernable episodes).

Given preliminary studies documenting the elevated incidence of suicidal behavior among BP youth, Lewinsohn et al. (11) have called for comparative studies within the BP group to identify risk factors differentiating pediatric BP patients with a history of attempt from those without. This approach has been widely utilized in the adult literature, yielding a fairly consistent set of risk factors for suicidal behavior among BP adults. Findings indicate that BP adults with a history of suicide attempt are more likely to report a positive family history of suicide (13–15) and a history of physical and/or sexual abuse (16). Clinical characteristics of adult BP suicide attempters include the presence of dysphoric (i.e., mixed) manic states, multiple major depressive episodes (17), and a comorbid panic (18, 19) and/or substance use disorder (20). Trait aggression (21) and impulsivity (22) have also been linked to increased risk for suicide attempt among BP adults. The risk associated with psychosis is unclear, with some documenting increased suicidal behavior among BP patients with psychotic features (23) and others finding no difference (24). Similarly, the literature on suicide attempts and bipolar sub-categories is inconsistent, with some reporting higher attempt rates among BPII patients (25), others associating a BPI diagnosis with higher risk (26), and still others finding no differences between subtypes (27). Lastly, the protective effects of lithium treatment against suicide have been suggested among adult BP patients (28), whereas the

literature on other classes of medications, including antidepressants, anticonvulsants, and atypical antipsychotics, remains inconclusive (29).

To date, research has not examined to what extent these risk factors for suicidal behavior among BP adults apply to youth with the illness. Given that investigators have elucidated several features distinguishing the illness in children and teens from that in adults (30, 31), distinct risk factors for suicidal behavior may also exist. Identification of such risk factors may serve to inform the development of both preventive and therapeutic interventions for this high-risk group. We therefore examined: (i) the lifetime prevalence and nature of suicidal behavior, and (ii) demographic, clinical, diagnostic, and family history variables associated with a lifetime history of suicide attempt, among a sample of pediatric BP patients enrolled in the Course and Outcome of Bipolar Youth (COBY) multi-site study. Subsequent studies will describe the incidence and risk factors associated with suicidal behavior over longitudinal follow up.

Methods

Participants

Subjects included 405 BP children and adolescents aged 7–17 who gave informed consent to participate in the evaluation of their illness in the COBY study, a longitudinal naturalistic multi-site study of pediatric BP. Subjects were primarily recruited through clinical referrals within three academic medical centers (University of Pittsburgh, $n = 189$; Brown, $n = 138$; and UCLA, $n = 78$); community referrals and print advertisements were also utilized to recruit subjects. The Institutional Review Boards at each of the three participating universities reviewed and approved all study procedures prior to subject enrollment.

Inclusion criteria—Subjects met the following criteria: (i) current age 7 years 0 months to 17 years 11 months; (ii) fulfill criteria for DSM-IV bipolar I disorder (BPI), bipolar II disorder (BPII), or study-operationalized criteria for bipolar disorder not otherwise specified (BP NOS, see *Diagnosis* below) via the Schedule for Affective Disorders and Schizophrenia for School-Aged Children, Present Episode 4th version (K-SADS-P; 32) Depression Section and Mania Rating Scale (K-SADS-MRS; 33); (iii) determined to have a primary bipolar disorder (not induced by substance use, medications, or a medical condition); and (iv) intellectual functioning within normal limits.

Demographics/patient illness characteristics—The sample was comprised of 217 (54%) male subjects and 188 (46%) female subjects with an average age of 12.7 years ($SD = 3.2$). Subjects were, on average, middle class (mean socioeconomic status (SES) = 3.4, $SD = 1.2$; 34). Eighty-three percent ($n = 338$) of subjects identified themselves as Caucasian, 6% ($n = 26$) African-American, 8% ($n = 33$) bi/multi-racial, 1% ($n = 5$) Asian, and 1% ($n = 3$) other racial classification. Two hundred thirty-six participants (58%) met criteria for BPI, 29 (7%) BPII, and 140 (35%) BP NOS. Comorbid psychiatric conditions were common in this sample; on average, patients met DSM-IV criteria for three K-SADS diagnoses, the most common of which include attention deficit-hyperactivity disorder (ADHD; 60%) and oppositional defiant disorder (ODD; 39%).

Procedures

Diagnosis—All COBY diagnosticians have either a Bachelor's or Master's degree in a mental health field, and attended K-SADS training sessions. After consent and assent were obtained, parents were interviewed about their children and children were directly interviewed for the presence of non-mood psychiatric disorders using the K-SADS-PL (32). Due to the comprehensive coverage of symptoms, the K-SADS-P depression and mania

sections were used to assess each period of mood problems in order to determine whether DSM-IV diagnostic criteria for a mood episode was met; onset and offset were determined for both current and most severe past episode DMS-IV mood disorders. Severity of depressive and manic symptoms for the current affective episode (worst week in the month preceding assessment) was recorded on the K-SADS-P depression section and K-SADS-MRS. The most severe week of depressive and manic symptoms in the subject's lifetime was assessed via the K-SADS-PL in the first 87 subjects, and subsequently the K-SADS-P depression section and the K-SADS-MRS.

K-SADS symptom ratings and diagnoses were based on consensus ratings incorporating all available data; in the event of conflicting information, summary ratings were guided by clinical judgment. Diagnoses were confirmed by a child psychiatrist/psychologist subsequent to the interview. To maintain reliability across sites, bimonthly conference calls between sites addressed assessment questions and concerns. Based on ratings of 13 study interviews (4–7 raters per case), inter-rater reliabilities for mood disorders were 0.75 (kappa); kappas for non-mood disorders were 0.80. The intraclass coefficient (ICC) for the K-SADS-MRS (12 cases) was 0.96, and the Depression Rating Scale (DRS) (12 cases) was 0.98.

The National Institute of Mental Health (NIMH) Consensus Roundtable (34) recommends inclusion of children and adolescents with significant subsyndromal bipolar symptomatology in studies to further evaluate bipolar spectrum disorders in youth and maximize generalizability of results. Given that the DSM-IV criteria for BP NOS are vague and there are no other available criteria for this bipolar subtype, study investigators operationalized specific BP NOS criteria for the present study as follows: elevated and/or irritable mood, plus: (i) two associated DSM-IV manic symptoms (three if only irritable mood), (ii) change in functioning, (iii) mood and symptom duration of at least 4 h within a 24-h period, and (iv) episode frequency of at least four cumulative 24-h periods meeting the mood, symptom, and functional change criteria over the subject's lifetime. COBY data on clinical course and outcome provide preliminary validation for these operationalized BP NOS criteria (35).

Lifetime suicide attempt—Suicidal acts during the current affective episode (worst week in the month preceding evaluation), most severe past episode, and lifetime (summary diagnostic checklist suicidality item) were evaluated at intake via the K-SADS (see *Diagnosis*, above). According to the widely cited definitional system proposed by O'Carroll et al. (36), suicide attempt refers to 'a potentially self-injurious behavior with a non-fatal outcome for which there is evidence (either explicit or implicit) that the person intended at some level to kill himself/herself. A suicide attempt may not result in injuries.' The term 'suicide gesture' is not recommended by the NIMH task force, nor is it included among operational definitions posed by experts in the field (36). In a review of assessment instruments for suicidal behavior in youth, Goldston (37) highlighted the use of the phrase 'gestures or attempts' in the K-SADS depression ratings suicidal acts item which serves to confound ratings of suicidal behavior and suicidal intent. It should be noted that this is not the case on the K-SADS Lifetime Diagnostic Checklist, where suicide gestures are assessed and rated separate from attempts. Although the term 'suicide gesture' is not operationally defined in the K-SADS, COBY evaluators were instructed to rate self-injurious behaviors 'judged to be non-serious in intent or medical lethality' (37) as 'gestures' on the Lifetime Diagnostic Checklist (any act with evidence of intent or lethality was rated as an attempt). As a means of addressing the confound in the K-SADS depression ratings, and capturing the core elements of the operationalized definition of suicide attempt, we defined a suicide attempt as a self-injurious act that includes some degree of seriousness and/or lethality. We

then subjected all available information on suicidal acts gathered from the K-SADS to this definition to yield the specific criteria for suicide attempt utilized in the study (Table 1).

Other clinical information—Basic demographic information was obtained at intake, including a five-factor scale for socioeconomic status (38). Medication exposure history and history of abuse were systematically obtained using a medical history questionnaire widely utilized at the Western Psychiatric Institute in research protocols. Information on subjects' comorbid diagnoses and clinical characteristics (i.e., mixed episodes, psychosis, and self-injurious behavior) were garnered from summary scores from the K-SADS interview with the child and the parent. The age of onset for a subject's BP illness was considered to be when the subject first met DSM-IV criteria for a manic, mixed, hypomanic, or major depressive episode, or when he/she first met COBY criteria for BP NOS.

Parents of subjects were interviewed at intake about their personal psychiatric history using the Structured Clinical Interview for DSM-IV (SCID; 39). The parents were also interviewed regarding the psychiatric status of all first- and second-degree relatives using the Family History Screen, which has demonstrated adequate reliability and validity (40). A family history was considered to be positive if the disorder was rated as 'definitely' present in a relative.

Statistical analysis

Statistical analyses were performed using the Statistical Package for the Social Sciences Version 12 (SPSS). Analyses were conducted in three phases. First, potential risk factors were screened for their association with suicide attempt history using chi-square tests for categorical variables and *t*-tests for continuous variables. Given the dearth of information on predictors of suicide attempts in this population, we approached these analyses as hypothesis-generating, and therefore did not apply a statistical adjustment for multiple comparisons (e.g., Bonferroni). Second, factors that were associated with suicide attempts in the univariate analyses were entered into multivariate logistic regression models conducted in each of three identified domains: clinical/illness history, comorbid diagnostic conditions, and family history to estimate the adjusted odds of suicide attempt associated with each risk factor controlling for the effects of other risk factors within that domain. Statistical significance was set at $\alpha = 0.05$. Finally, in an attempt to examine the magnitude of these relationships and determine a model best fit to the data, a simultaneous logistic regression analysis was performed on the set of variables found significant in each of the three domain analyses.

Results

Prevalence and demographic variables

Thirty-two percent of the sample ($n = 128$) endorsed a lifetime history of at least one suicide attempt according to our criteria. As can be seen in Table 2, no significant differences emerged between attempters and non-attempters with respect to sex, race, socioeconomic status, or living situation. Suicide attempters in the sample were significantly older than non-attempters.

Figure 1 depicts K-SADS-P depression section most severe lifetime ratings of suicide items for suicide attempters in the sample. Sixty-seven percent of participants classified as suicide attempters had a lifetime history of frequent and intense suicidal ideation rated moderate or higher. According to the K-SADS seriousness of suicidal intent item, 11% of suicide attempts reported were classified as 'extreme-every anticipation of death.' Of note, 19% of those who were classified as suicide attempters according to our criteria denied suicidal

ideation on the K-SADS interview. Medical lethality ratings indicate that the actual medical threat ascribed to attempts by evaluators was high, with 16% of attempts rated moderate or higher when accounting for considerations including method, likelihood of rescue, and amount of medical treatment required.

Clinical and illness history variables

The clinical characteristics of attempters and non-attempters are summarized in Table 3. Attempters were significantly more likely to have a lifetime history of psychiatric hospitalizations, mixed episodes, and psychotic features. Furthermore, attempters endorsed more lifetime non-suicidal self-injurious behavior as rated by the K-SADS, referring to any physical self-damaging act performed *without intent of killing oneself* but with full intent of inflicting physical harm to oneself; examples include scratching, cutting, or burning oneself as a means of relieving or expressing emotional pain. Attempters also reported a greater history of physical and/or sexual abuse than non-attempters. More BP patients with illness onset after age 12 attempted suicide than those with illness onset prior to age 12. Moreover, a higher percentage of BPI participants attempted suicide than BP NOS ($\chi^2(1) = 7.48, p < 0.01$). We did not explore the relationship between pharmacological and/or psychosocial treatment history and attempter status.

Next, we conducted a logistic regression analysis in the clinical domain entering the significant variables from the univariate analyses (above) as predictors of suicide attempt status. After covarying for the effects of current age, four variables remained significantly predictive of increased risk for lifetime suicide attempt within the clinical domain: history of self-injurious behavior (OR = 2.45, 95% CI = 1.5–4.0, $p < 0.01$), psychiatric hospitalizations (OR = 2.48, 95% CI = 1.43–4.32, $p < 0.01$), mixed episodes (OR = 2.08, 95% CI = 1.15–3.74, $p = 0.02$), and psychosis (OR = 1.75, 95% CI = 1.04–2.92, $p = 0.03$).

We also examined the relationship between suicide attempter status and most severe lifetime ratings of functioning and symptomatology. Children's Global Assessment Scale ratings (C-GAS; 41) indicate that during the worst lifetime period of illness, suicide attempters were more impaired than non-attempters ($t = 5.91, p < 0.01$). Similarly, the most severe lifetime episode of depression rated on the K-SADS-DRS was significantly worse for attempters ($t = -6.73, p < 0.01$). However, worst manic episode ratings on the K-SADS-MRS did not distinguish between groups ($t = -1.32, p = 0.2$).

Comorbid diagnostic conditions

Table 4 summarizes the findings regarding Axis I comorbidity and suicide attempter status. All comorbid diagnoses considered are based on fulfilling lifetime criteria. Analyses indicate that a comorbid substance use disorder and panic disorder were more common among attempters than non-attempters. Attempters were significantly less likely to meet criteria for a lifetime diagnosis of ADHD. However, neither the presence of a comorbid anxiety disorder, nor a disruptive behavioral disorder (ODD or conduct disorder), was significantly related to suicide attempter status.

The logistic regression analysis (with age entered as a covariate) in the diagnostic comorbidity domain indicates that lifetime panic disorder (OR = 4.28, 95% CI = 1.64–11.18, $p < 0.01$) and substance use disorder (OR = 2.86, 95% CI = 1.34–6.14, $p < 0.01$) remain significantly associated with suicide attempt. There was a trend for an ADHD diagnosis to incur decreased risk for suicidal behavior (OR = 0.65, 95% CI = 0.41–1.03, $p = 0.07$).

Family variables

Examination of family history variables (Table 5) indicates that suicide attempters were more likely to have a positive family history of suicide attempt. A trend emerged, nearing statistical significance, for greater likelihood of suicidal behavior in relatives of attempters. However, family history positive for major depression, mania, conduct disorder, substance use disorder, and suicide completion was not significantly different between attempters and non-attempters. Controlling for the effects of current age, logistic regression in the family domain shows that neither family history of suicidal attempts (OR = 1.59, 95% CI = 0.88–2.85, $p = 0.1$) nor suicidal behavior (OR = 1.25, 95% CI = 0.70–2.20, $p = 0.5$) remain significantly related to attempter status.

Best-fit model

In order to examine a model best fit to predict suicide attempter status, we entered the six surviving predictors from the domain-specific regression analyses [lifetime psychosis, mixed states, psychiatric hospitalizations, and self-injurious behavior (domain: clinical/illness history variables); lifetime panic disorder and substance use disorder (domain: comorbid diagnostic conditions); no variables from the family history domain remained significantly associated with suicide attempter status] into one logistic regression analysis. All predictors remained significantly associated with suicide attempt status in the model (Table 6); a goodness-of-fit test (HL $\chi^2 = 6.61$, $p = 0.60$) indicates that this model represents a good fit for the data.

Discussion

In our sample of pediatric BP subjects, 32% had made at least one lifetime suicide attempt characterized by significant seriousness and/or lethality. This prevalence rate is in the mid-range of the three existing studies documenting suicide attempt rates in BP children and adolescents: 20% over 5-year follow up in BPI adolescents (10), 44% in a community sample of adolescents with BP spectrum disorders (11), and 15% for chronic BPI, 47% for episodic BPI pediatric patients (12). Differences in reported prevalence rates between these samples may be attributable to age ranges included in the sample (childhood versus adolescence), severity of the sample (BPI versus other BP types), time frame of suicide attempts assessed (lifetime versus follow up), and methods of assessing/defining suicide attempt employed in each of the studies. To date, there have been no completed suicides in our sample.

To our knowledge, this is the first report on the correlates of suicidal behavior in pediatric BP. Results of the present study indicate that several of the risk factors associated with suicidal behavior in adult BP are also related to suicidal behavior in pediatric BP. Our findings suggest that the most robust predictors of suicide attempt fall into two domains: clinical/illness history variables and comorbid diagnostic conditions. Family history variables emerged as less salient in predicting suicide attempter status.

In keeping with findings from the adult BP literature (17, 23), children and adolescents in the COBY sample with a history of mixed episodes and psychotic features were more likely to have attempted suicide. The available data does not allow us to examine the temporal relationship between these clinical features and suicide attempts; however, future analyses of the COBY longitudinal follow-up data will allow for examination of clinical state preceding suicidal behavior.

Both comorbid substance use disorder and panic disorder have been shown to impart elevated risk for suicide attempt in adult BP, and these comorbidities also appear to be risk factors for suicide attempts in pediatric BP. Given findings documenting elevated levels of

impulsivity among adult BP suicide attempters (22), and the impulsivity often associated with ADHD, we were surprised to find that a higher percentage of non-attempters had a lifetime history of ADHD in the sample. However, other studies have failed to find any relationship between ADHD and suicidal behavior in adolescents (42).

Those patients with a history of suicide attempt exhibited a more severe illness history, with a greater history of psychiatric hospitalizations, and more severe lifetime ratings of global functioning and depression. However, ratings of most serious lifetime manic episode did not distinguish attempters from non-attempters. These findings highlight the importance of assessing both current symptomatology and past episodes when assessing suicidal risk in pediatric BP patients.

A history of non-suicidal self-injurious behavior emerged as a robust predictor of suicide attempts in this population, replicating findings among adult psychiatric populations (43, 44). The nature of this relationship remains largely unexplored to date. Nock and Prinstein (45) posited that self-injurious behavior and suicide attempts share a functional drive: escaping negative experiences. Moreover, self-injurious behavior and suicide attempts share common etiological factors, including negative mood, impulsivity, and a history of trauma (46, 47). It is also possible that in pediatric BP, self-injurious behavior may represent a marker for more severe affective dysregulation and/or illness severity as has been proposed in the literature on borderline personality disorder (48). In fact, the common clinical features of affective lability and suicidality in bipolar and borderline disorders have led some to argue that these diagnoses lie along a continuum of mood disorder (49). Future studies should therefore consider assessing Axis II pathology in order to further explore this relationship in youth.

Further exploration of the role of genetics in suicidal behavior may also be warranted given the finding that pediatric BP suicide attempters have higher rates of suicide attempts among family members. Findings from Brent et al. (50) support a genetic link to suicidal behavior over and above the risk for affective disorder. It is also possible that an environmental learning component may contribute to the modeling of suicidal behavior in these families.

In keeping with findings from the general literature on adolescent suicide (51), younger patients in the COBY sample were less likely to have attempted suicide than older adolescents, likely due to a complex interaction of developmental, psychological, and family factors. Although age of BP onset did not survive the logistic regression analysis, univariate analysis indicates that a higher percentage of attempters reported illness onset after age 12. This finding may initially appear contrary to the adult BP literature in which earlier age of onset has been associated with higher risk (5). However, in their study establishing the relationship between earlier age of BP onset and attempts in adults, Leverich et al. reported a mean onset age of 17 for attempters (versus 21 for non-attempters), highlighting the fact that 'early onset' is a relative term. Given that the COBY sample focuses expressly on a pediatric sample and therefore includes 17 as the upper age limit, it is possible that a critical period for vulnerability to the development of suicidal behavior exists for pediatric onset, when compared with adult-onset, BP.

The significant association in the univariate analysis between a history of physical/sexual abuse and lifetime suicide attempt is in accordance with the findings of Leverich et al. (5, 16) linking sexual abuse and suicide attempts in BP adults. This relationship suggests that early adverse experiences may serve to create a vulnerability for subsequent affective episodes.

Our findings suggest that a BPI diagnosis imparts elevated risk for suicide attempts over BP NOS in children and adolescents. One possible interpretation is that BPI represents a more

severe form of the illness than BP NOS. No significant differences emerged with respect to the BP-II subtype. In multiple studies from the adult literature, a diagnosis of BP-II has been associated with increased risk for suicidal behavior. This disparity in findings may be related to the small number of BP-II patients in our sample (7%), resulting in insufficient power to detect group differences. Alternatively, findings indicate BP-II may be an unstable diagnostic category in pediatric patients, as 20% of BP-II children and teens go on to develop BP-I (35). Future studies may aim to examine a larger sample of BP-II patients to further explore differences between bipolar subtypes.

Limitations

The limitations of the present study include the reliance on patient and parent retrospective report of suicidal behavior. Additionally, the K-SADS depression ratings do not distinguish between suicide gestures and suicide attempts despite expert recommendations calling for standardized nomenclature for suicidal behavior in which the term ‘gesture’ is not endorsed (36). To decrease the likelihood that self-injurious behaviors (i.e., gestures) would be counted as suicide attempts, and that suicidal acts and intent would be confounded by K-SADS depression ratings, we further limited the definition of suicide attempt used herein to include only those acts of self-harm that included some degree of intent and/or lethality. Furthermore, given that K-SADS ratings of suicidal behavior are gathered only in the context of the current and most severe past depressive episodes, suicidal acts occurring outside of these discrete mood episodes may have gone unreported. We aimed to capture those lifetime suicide attempts occurring outside of the K-SADS mood episode ratings (and thereby decrease the likelihood that our findings *underestimate* suicide attempts in this population) by including an affirmative evaluator rating on the suicide attempt item on the K-SADS Summary Lifetime Diagnostic Checklist in our definition of suicide attempt. Furthermore, detailed information regarding method and precipitants of suicide attempts are not gathered via the K-SADS ratings.

COBY is primarily a clinical sample recruited from outpatient and inpatient facilities, and thus may not be representative of pediatric BP patients who have not sought treatment. Furthermore, the COBY sample is predominately Caucasian. Given that risk factors for suicidal behavior specific to certain minority groups have been identified (51), the present findings may not be representative of cultural minority groups.

The present study does not allow us to infer the direction of the relationship between the identified risk factors and suicide attempts in this population. Furthermore, we were not able to explore the temporal relationship between risk factors (e.g., onset of substance use, physical and/or sexual abuse) and suicide attempts, such that certain risk factors may have come after the suicide attempt rather than as precursors. We also did not examine clinical presentation at the time of attempt, nor the relationship between psychosocial and pharmacological treatments and suicidal behavior. Future studies from the COBY sample using longitudinal data will aim to address the temporal relationship between these variables.

Clinical implications

Pediatric BP carries a high risk for suicidal behavior. Early recognition of those pediatric BP patients at highest risk for suicidal behavior may guide our clinical recognition of, and intervention for, those at highest risk. Findings from the present study indicate that pediatric bipolar patients at highest risk for suicide attempt include those who are older, with a lifetime history of mixed episodes, psychotic features, and BP-I, comorbid substance use, panic disorder, non-suicidal self-injurious behavior, family history of suicide attempt, history of hospitalization, and history of physical and/or sexual abuse. Although at present

we know little about the treatment of suicidality in pediatric BP patients, the present findings highlight the importance of future work on the development, study, and improvement of treatments for suicidal behavior in pediatric BP.

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References

1. Baldessarini RJ, Tondo L. Suicide risk and treatments for patients with bipolar disorder. *J Am Med Assoc.* 2003; 290:1517–1518.
2. Goodwin, FK.; Jamison, K. *Manic-Depressive Illness.* xxi. New York, NY: Oxford University Press; 1990.
3. Lish JD, Dime-Meehan S, Whybrow PC, Price RA, Hirschfeld RM. The National Depressive and Manic- Depressive Association (DMDA) survey of bipolar members. *J Affect Disord.* 1994; 31:281–294. [PubMed: 7989643]
4. Perlis RH, Miyahara S, Marangell LB, et al. Long-term implications of early onset in bipolar disorder: Data from the first 1000 participants in the Systematic Treatment Enhancement Program for Bipolar Disorder (STEP-BD). *Biol Psychiatry.* 2004; 55:875–881. [PubMed: 15110730]
5. Leverich GS, Altshuler LL, Frye MA, et al. Factors associated with suicide attempts in 648 patients with bipolar disorder in the Stanley Foundation Bipolar Network. *J Clin Psychiatry.* 2003; 64:506–515. [PubMed: 12755652]
6. Brent DA, Perper JA, Goldstein CE, et al. Risk factors for adolescent suicide: a comparison of adolescent suicide victims with suicidal inpatients. *Arch Gen Psychiatry.* 1988; 45:581–588. [PubMed: 3377645]
7. Brent DA, Perper JA, Moritz G, et al. Psychiatric risk factors of adolescent suicide: a case-control study. *J Am Acad Child Adolesc Psychiatry.* 1993; 32:521–529. [PubMed: 8496115]
8. Srinath S, Reddy Y, Girimaji SR, Seshadri SP, Ubbakrishna DK. A prospective study of bipolar disorder in children and adolescents from India. *Acta Psychiatr Scand.* 1998; 98:437–442. [PubMed: 9879784]
9. Welner A, Welner Z, Fishman R. Psychiatric adolescent inpatients: eight to ten-year follow-up. *Arch Gen Psychiatry.* 1979; 36:698–700. [PubMed: 444023]
10. Strober M, Schmidt-Lackner S, Freeman R, Bower S, Lampert C, DeAntonio M. Recovery and relapse in adolescents with bipolar affective illness: a five-year naturalistic, prospective follow-up. *J Am Acad Child Adolesc Psychiatry.* 1995; 34:724–731. [PubMed: 7608045]
11. Lewinsohn, PM.; Seeley, JR.; Klein, DN. Bipolar disorder in adolescents: epidemiology and suicidal behavior. In: Geller, B.; DelBello, MP., editors. *Bipolar Disorder in Childhood and Early Adolescence.* New York: Guilford Press; 2003. p. 7-24.
12. Bhangoo RK, Dell ML, Towbin KE, et al. Clinical correlates of episodicity in juvenile mania. *J Child Adolesc Psychopharmacol.* 2003; 13:507–514. [PubMed: 14977463]
13. Roy A. Genetic and biologic risk factors for suicide in depressive disorders. *Psychiatr Q.* 1993; 64:345–358. [PubMed: 8234546]
14. Linkowski P, de Maertelaer V, Delarbre C, Papadimitriou G, Mendlewicz J. Familial factors in suicidal behavior. *International Journal of Family Psychiatry.* 1988; 9:123–133.
15. Stallone F, Dunner DL, Ahearn J, Fieve RR. Statistical predictions of suicide in depressives. *Compr Psychiatry.* 1980; 21:381–387. [PubMed: 7418380]
16. Leverich GS, McElroy SL, Suppes T, et al. Early physical and sexual abuse associated with an adverse course of bipolar illness. *Biol Psychiatry.* 2002; 52:288–297. [PubMed: 11958779]

17. Oquendo MA, Waternaux C, Brodsky B, et al. Suicide behavior in bipolar mood disorder: clinical characteristics of attempters and nonattempters. *J Affect Disord.* 2000; 59:107–117. [PubMed: 10837879]
18. Cox BJ, Dorenfeld DM, Swinson RP, Norton GR. Suicidal ideation and suicide attempts in panic disorder and social phobia. *Am J Psychiatry.* 1994; 151:882–887. [PubMed: 8184998]
19. Rudd MD, Dahm PF, Rajab MH. Diagnostic comorbidity in persons with suicidal ideation and behavior. *Am J Psychiatry.* 1993; 150:928–934. [PubMed: 8494071]
20. Dilsaver SC, Chen Y, Swann AC, Shoaib AM, Krajewski KJ. Suicidality in patients with pure and depressive mania. *Am J Psychiatry.* 1994; 151:1312–1315. [PubMed: 8067486]
21. Oquendo MA, Mann JJ. Identifying and managing suicide risk in bipolar patients. *J Clin Psychiatry.* 2001; 62:31–34. [PubMed: 11765094]
22. Michaelis BH, Goldberg JF, Davis GP, Singer TM, Garno JL, Wenzel SJ. Dimensions of impulsivity and aggression associated with suicide attempts among bipolar patients: a preliminary study. *Suicide Life Threat Behav.* 2004; 34:172–176. [PubMed: 15191273]
23. Axelsson R, Lagerkvist-Briggs M. Factors predicting suicide in psychotic patients. *Eur Arch Psychiatry Clin Neurosci.* 1992; 241:259–266. [PubMed: 1606189]
24. Black D, Winokur G, Nasrallah A. Effect of psychosis on suicide risk in 1593 patients with unipolar and bipolar affective disorders. *Am J Psychiatry.* 1988; 145:849–852. [PubMed: 3381930]
25. Rihmer Z, Pestaloty P. Bipolar II disorder and suicidal behavior. *Psychiatr Clin North Am.* 1999; 22:667–673. [PubMed: 10550861]
26. Perugi G, Musetti L, Pezzica P, Piagentini F, Cassano G, Akiskal H. Suicide attempts in primary major depression subtypes. *Psychiatr Fenn.* 1988; 19:95–102.
27. Slama F, Bellivier F, Henry C, et al. Bipolar patients with suicidal behavior: toward the identification of a clinical subgroup. *J Clin Psychiatry.* 2004; 65:1035–1039. [PubMed: 15323586]
28. Baldessarini RJ, Tondo L, Hennen J. Treating the suicidal patient with bipolar disorder. Reducing suicide risk with lithium. *Ann N Y Acad Sci.* 2001; 932:24–38. [PubMed: 11411189]
29. Ernst C, Goldberg JF. Antisuicide properties of psychotropic drugs: a critical review. *Harv Rev Psychiatry.* 2004; 12:14–41. [PubMed: 14965852]
30. Geller B, Williams M, Zimmerman B, Frazier J, Beringer L, Warner KL. Prepubertal and early adolescent bipolarity differentiate from ADHD by manic symptoms, grandiose delusions, ultra-rapid or ultradian cycling. *J Affect Disord.* 1998; 51:81–91. [PubMed: 10743841]
31. Wozniak J, Biederman J, Kiely K, et al. Mania-like symptoms suggestive of childhood-onset bipolar disorder in clinically referred children. *J Am Acad Child Psychiatry.* 1995; 34:867–876.
32. Kaufman J, Birmaher B, Brent D, et al. Schedule for Affective Disorders and Schizophrenia for School-Age Children-Present and Lifetime Version (K-SADS-PL): initial reliability and validity data. *J Am Acad Child Adolesc Psychiatry.* 1997; 36:980–988. [PubMed: 9204677]
33. Axelson D, Birmaher BJ, Brent D, Wassick S, Hoover C, Bridge J, Ryan N. A preliminary study of the Kiddie Schedule for Affective Disorders and Schizophrenia for School-Age Children Mania Rating Scale for children and adolescents. *J Child Adolesc Psychopharmacol.* 2003; 13:463–470. [PubMed: 14977459]
34. National Institute of Mental Health research roundtable on prepubertal bipolar disorder. *J Am Acad Child Adolesc Psychiatry.* 2001; 40:871–878. [PubMed: 11501685]
35. Birmaher B, Axelson D, Strober M, Gill MK, Valeri S, Chiappetta L, Ryan N, Leonard H, Hunt J, Iyengar S, Keller M. Clinical course of children and adolescents with bipolar spectrum disorders. *Archives of General Psychiatry.* in press.
36. O'Carroll PW, Berman AL, Maris RW, Moscicki EK, Tanney BL, Silverman MM. Beyond the Tower of Babel: a nomenclature for suicidology. *Suicide Life Threat Behav.* 1996; 26:237–252. [PubMed: 8897663]
37. Goldston D. Assessment of Suicidal Behaviors and Risk among Children and Adolescents. 2000 Report No.: Technical Report Submitted to NIMH under contract no. 263-MD-909995.
38. Hollingshead, A. Four-factor Index of Social Status. New Haven, CT: Yale University; 1975.

39. Spitzer, RL.; Williams, JBW.; Gibbon, M.; First, MB. The Structured Clinical Interview for DSM-III-R/DSM-IV. New York: New York State Psychiatric Institute; 1996.
40. Weissman MM, Wickramatne P, Adams P, Wolk S, Verdelli H, Olfson M. Brief screening for family psychiatric history: the family history screen. *Arch Gen Psychiatry*. 2000; 57:675–682. [PubMed: 10891038]
41. Shaffer D, Gould MS, Brasic J, Ambrosini P, Fisher P, Bird H. A Children's Global Assessment Scale (C-GAS). *Arch Gen Psychiatry*. 1983; 40:1228–1231. [PubMed: 6639293]
42. Lewinsohn PM, Rohde P, Seeley JR, Baldwin CL. Gender differences in suicide attempts from adolescence to young adulthood. *J Am Acad Child Adolesc Psychiatry*. 2001; 40:427–434. [PubMed: 11314568]
43. Favazza AR, Conterio K. Female habitual self-mutilators. *Acta Psychiatr Scand*. 1989; 79:283–289. [PubMed: 2711856]
44. Stanley B, Gameroff M, Michalsen V, Mann JJ. Are suicide attempters who self-mutilate a unique population? *Am J Psychiatry*. 2001; 158:427–432. [PubMed: 11229984]
45. Nock MK, Prinstein MJ. Contextual features and behavioral functions of self-mutilation among adolescents. *J Abnorm Psychol*. 2005; 114:140–146. [PubMed: 15709820]
46. Horesh N, Gothelf D, Offe KH, Apter A. Impulsivity as a correlate of suicidal behavior in adolescent psychiatric inpatients. *Crisis*. 1999; 20:8–14. [PubMed: 10365500]
47. Zlotnick C, Shea MT, Pearlstein T, Simpson E. The relationship between dissociative symptoms, alexithymia, impulsivity, sexual abuse, and self-mutilation. *Compr Psychiatry*. 1996; 37:12–16. [PubMed: 8770520]
48. Linehan, MM. Cognitive-behavioral Treatment of Borderline Personality Disorder. New York: Guilford Press; 1993.
49. Akiskal HS, Chen SE, Davis GC, Puzantian VR, Kashgarian M, Bolinger JM. Borderline: an adjective in search of a noun. *J Clin Psychiatry*. 1985; 46:41–48. [PubMed: 3968045]
50. Brent DA, Bridge J, Johnson BA, Connolly J. Suicidal behavior runs in families: a controlled family study of adolescent suicide victims. *Arch Gen Psychiatry*. 1996; 53:1145–1152. [PubMed: 8956681]
51. Spirito, A. Understanding attempted suicide in adolescence. In: Spirito, A.; Overholser, JC., editors. *Evaluating and Treating Adolescent Suicide Attempters*. San Diego, CA: Academic Press; 2003. p. 1-18.

Fig. 1.
K-SADS-P Depression Section lifetime severity ratings for suicide attempters.

Table 1

Suicide attempt criteria

Suicide attempt defined as fulfilling any one of the following three criteria		
Criteria 1	Criteria 2	Criteria 3
K-SADS-P depression section (0–6 scale)	K-SADS-PL depressive disorders section (0–3 scale)	K-SADS Summary Lifetime Diagnostic Checklist
At least one of the following:	At least one of the following:	Lifetime suicide attempt item rated 'yes' (clinically significant) by the evaluator
Seriousness	Seriousness	
Suicidal acts – seriousness rated '3' (definite but ambivalent) or above and/or	Suicidal acts – seriousness rated '2' (subthreshold) or above and/or	
Lethality	Lethality	
Suicidal acts – medical lethality rated '3' (mild) or above	Suicidal acts – medical lethality rated '2' (subthreshold) or above	

Table 2

Demographic variables in pediatric bipolar suicide attempters and non-attempters

Variable	Attempters (n = 128)	Non-attempters (n = 277)	χ^2 or t	df	p-value
Age (Mean $\pm$ SD)	13.7 $\pm$ 3.1	12.3 $\pm$ 3.1	$t = -4.16$	403	<0.001
Sex (% female)	61 (48)	127 (46)	$\chi^2 = 0.12$	1	0.73
Race (% Caucasian)	108 (85)	230 (83)	$\chi^2 = 0.11$	1	0.74
Socioeconomic status ^a (Mean $\pm$ SD)	3.5 $\pm$ 1.1	3.4 $\pm$ 1.2	$t = -0.46$	403	0.65
Living situation (% with both parents)	51 (40)	123 (45)	$\chi^2 = 1.26$	1	0.53

^aHollingshead (38).

Table 3

Clinical/illness history variables and history of suicide attempt

	Attempters n = 128 (%)	Non-attempters n = 277 (%)	χ^2	df	p-value
Psychiatric hospitalization	96 (75)	123 (45)	32.63	1	<0.001
Self-injurious behavior	69 (54)	83 (30)	21.69	1	<0.001
Mixed episodes	49 (38)	52 (19)	17.80	1	<0.001
Psychosis	56 (44)	74 (27)	11.66	1	0.001
Physical/sexual abuse	41 (32)	54 (20)	4.56	1	0.006
Age of BP onset (>age 12)	45 (35)	69 (25)	4.55	1	0.03
Bipolar subtype			12.58	2	0.002
Bipolar I	86 (67)	150 (54)			
Bipolar II	13 (10)	16 (6)			
Bipolar NOS	29 (23)	111 (40)			

BP = bipolar disorder; NOS = not otherwise specified.

Table 4

Comorbid diagnostic conditions and history of suicide attempt

	Attempters n = 128 (%)	Non-attempters n = 277 (%)	χ^2	p-value
Panic disorder	15 (12)	7 (3)	14.40	<0.001
Substance use disorder	22 (17)	14 (5)	15.91	<0.001
ADHD	62 (48)	179 (65)	9.52	0.002
Any anxiety disorder	57 (45)	104 (38)	1.78	0.2
Conduct disorder	20 (16)	32 (12)	1.30	0.3
ODD	45 (35)	111 (40)	0.89	0.4

df = 1 for all. ADHD = Attention Deficit-Hyperactivity Disorder; ODD = Oppositional Defiant Disorder.

Table 5

Family history variables and history of suicide attempt

	Attempters n = 128 (%)	Non-attempters n = 277 (%)	χ^2	p-value
Major depression	111 (89)	219 (83)	2.04	0.2
Mania	62 (50)	134 (51)	0.10	0.7
Conduct disorder	44 (36)	81 (31)	0.72	0.4
Substance use disorder	87 (70)	188 (72)	0.20	0.7
Suicidal behavior	64 (52)	108 (42)	3.11	0.08
Suicide attempt	59 (48)	96 (37)	4.0	0.05
Suicide completion	7 (6)	12 (5)	0.21	0.7

df = 1 for all.

Table 6

Best-fit model of predictors of suicide attempts

	OR	95% CI	Wald	p-value
Psychiatric hospitalization	2.47	1.48–4.13	11.84	0.001
Self-injurious behavior	2.24	1.39–3.63	10.81	0.001
Mixed episodes	2.03	1.21–3.41	7.17	0.007
Panic disorder	4.0	1.36–11.76	6.34	0.01
Substance use disorder	2.76	1.21–6.28	5.86	0.02
Psychosis	1.73	1.05–2.85	4.67	0.03

Current age entered as covariate.