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Examining the Impact of Psychiatric Diagnosis and Comorbidity on the Medical Lethality of Adolescent *Suicide Attempts*

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Abstract

Specific psychiatric diagnoses and comorbidity patterns were examined to determine if they were related to the medical lethality of *suicide attempts* among adolescents presenting to an urban general hospital ($N = 375$). Bivariate analysis showed that attempters with substance abuse disorders had higher levels of lethality than attempters without substance abuse. Regression results indicated having depression comorbid with any other diagnosis was not associated with medical lethality. However, having a substance abuse disorder was associated with higher *suicide attempt* lethality, highlighting the importance of substance abuse as a risk factor for lethal *suicide attempts* in adolescents. This finding stimulates critical thinking around the understanding of suicidal behavior in youth and the development and implementation of treatment strategies for suicidal adolescents with substance abuse disorders.

Suicide is the third leading cause of death for youth in the United States (Centers for Disease Control and Prevention, 2011), posing a significant public health problem for adolescents. In a large nationwide sample of high school students, 6% reported attempting suicide and 2% reported making an attempt requiring medical attention in the past 12 months (CDC, 2011). While the set of risk factors for adolescent suicide is complex and not fully understood, research suggests that medical lethality, defined as the seriousness of the physical consequences or risk to life, is the main determinant of the likelihood of death following a suicide attempt (Nasser & Overholser, 1999). Lethality is especially important to examine in suicide research with adolescents, as they are significantly less certain of the possible fatal outcome of their *suicide attempt* than adults (Parellada et al., 2007). This suggests that adolescents do not have the same knowledge of lethality of different *suicide attempt* methods (Nasser & Overholser, 1999) and that there may be characteristics other than depression severity and suicidal intent that contribute to lethal *suicide attempts* in adolescents. Further emphasizing the importance of *suicide attempt* lethality, it has been suggested that the psychological characteristics of adolescents who make highly lethal *suicide attempts* may be most similar to those of suicide completers (Beautrais, 2003; Brent, 1987).

The presence of a psychiatric disorder is the most common risk factor for *suicide attempts* among adolescents (Brent, 1995), but there is still controversy regarding which types of diagnoses put adolescents at greatest risk for lethal *suicide attempts*. While a diagnosis of a mood disorder with a comorbid psychiatric diagnosis appears to increase the risk of suicide (Nasser & Overholser, 1999; Renaud, Berlim, McGirr, Tousignant, & Turecki, 2008), it is still unclear what specific patterns of mood disorder comorbidity put youth at greatest risk (Fordwood, Asar-now, Huizar, & Reise, 2007). In a study on adolescent suicide attempters that examined both psychiatric diagnosis and medical lethality, Nasser and Overholser (1999) found that the group of adolescents with *suicide attempts* of highest lethality was the only group that had several individuals diagnosed with a major depressive episode and comorbid attention deficit disorder. In one of the few prior studies with youth that examined both *suicide attempt* lethality and psychiatric comorbidity, Brent (1987) found comorbid mood and substance abuse disorders to be predictive of *suicide attempts* of higher lethality. While most studies on adolescent suicide attempters have combined all mood disorders into one category, studies differentiating between depressive and bipolar disorders demonstrate mixed results with respect to the association with *suicide attempt* lethality. In a study comparing adolescent suicide completers with medically serious attempters, Beautrais (2003) found that child, adolescent, and young adult suicide completers were significantly more likely to have a diagnosis of bipolar disorder than attempters, in contrast to the findings by Nasser and Overholser, which demonstrated no significant differences in the medical lethality of *suicide attempts* of adolescents with bipolar disorders versus those with depressive disorders.

Although there are no other studies that specifically measure *suicide attempt* lethality, there is research demonstrating mood, disruptive, and substance use disorders as most commonly implicated in adolescent suicide completers (Brent et al., 1993; Portzky, Audenaert, & van Heeringen, 2005; Renaud et al., 2008; Shaffer, Gould, Fisher, Trautman, & Moreau, 1996). In their review of controlled studies, Fleischmann, Bertolote, Belfer, and Beautrais (2005) found youth with substance abuse disorders to be 5 to 10 times more likely and youth with conduct disorder to be 6 to 11 times more likely to complete suicide than those without the diagnoses. Brent et al. (1993) found substance abuse to be a more predictive risk factor of suicide completion when comorbid with a mood disorder than when diagnosed alone. Similar patterns have been demonstrated in studies that examined *suicide attempts*, rather than suicide completion, as the outcome. It has been shown that incarcerated adolescents with conduct problems have higher rates of *suicide attempts* and use more violent methods than adolescents in the general population (Penn, Esposito, Schaeffer, Fritz, & Spirito, 2003). Fordwood et al. (2007) found externalizing behaviors to be the strongest unique predictor of *suicide attempts* after accounting for the severity of depressive symptoms, suggesting that disruptive disorders are a risk factor for *suicide attempts* in adolescents. With respect to substance abuse, Wu et al. (2004) found *suicide attempts* to be strongly associated with alcohol abuse and dependence, even after controlling for depression. In a study examining differences between suicide attempters and ideators, Gould et al. (1998) found substance abuse to be the only psychiatric diagnostic predictor to independently differentiate the two groups.

Research findings on risk factors for adolescent suicide can be misleading because studies often place all *suicide attempts* in the same category, regardless of the medical lethality of the attempt. Adolescent *suicide attempts* can vary greatly with respect to medical lethality, and these variations make it difficult to draw general conclusions about risk factors for adolescent suicide when looking at attempts only. However, research methodologies that account for differences in the levels of lethality of attempts can help specify risk factors and will contribute to more effective adolescent suicide prevention efforts (Kelly, Lynch, Donovan, & Clark, 2001). The current study adds to the literature by deconstructing adolescent *suicide attempts* into different levels of medical lethality and psychiatric diagnoses into specific typologies and comorbidity patterns. In doing so, this allows an investigation of whether *suicide attempts* of high lethality, which may be most closely related to suicide completion (Beautrais, 2003; Brent, 1987), are associated with different typologies and combinations of psychiatric disorders than those *suicide attempts* of lower medical lethality.

Method

Study Design and Sample

Medical record data were collected from psychiatric evaluations of all adolescents (ages 13–18) who presented to an urban general hospital from 2006 to 2010 for a *suicide attempt* ($N = 375$). In accordance with contemporary classifications of suicidal behaviors (Silverman, Berman, Sanddal, O'Carroll, & Joiner, 2007), *suicide attempt* was defined in this study as a potentially self-injurious behavior associated with at least some intent to end one's life. Cases were excluded if, after review of the circumstances, it was unclear whether the self-injurious behavior met this definition of a *suicide attempt* ($n = 3$). Adolescent suicide completers were not included in this study. Other exclusions were adolescents with mental retardation ($n = 1$) and adolescents for whom data were missing regarding the dependent variable of *suicide attempt* lethality ($n = 1$). Repeat attempters ($n = 11$) were given the same case identification but were treated as multiple cases, as psychiatric diagnoses and *suicide attempt* lethality can evolve, making it possible for patients to have very different profiles at two points in time. Of the 11 repeat attempters in this study, nine attempted twice and two attempted three times; only one had no change in lethality and four had no change in psychiatric diagnosis across attempts. Repeat attempters were not dropped because it could not be determined whether any of the other attempters in this study had multiple *suicide attempts* which were previously treated at different hospitals. White correction for standard errors was used to address the issue of correlation of multiple observations from the same patient (White, 1980).

Measures

The dependent variable, medical lethality of the *suicide attempt*, was determined using the Lethality of *Suicide Attempt* Rating Scale II (LSARS-II; Berman, Shepherd, & Silverman, 2003). The LSARS-II, updated from the LSARS (Smith, Conroy, & Ehler, 1984), is rated on an 11-point scale ranging from 0 (*death is an impossible result*) to 10 (*death is almost a certainty*). The lethality of the *suicide attempt* is measured as a single rating, which reflects both the medical lethality and the circumstances of the attempt (Berman et al., 2003). The

LSARS and LSARS-II have demonstrated good interrater reliability in prior studies, with intraclass correlation coefficients between .80 and .90 (Nasser & Overholser, 1999; Smith et al., 1984), and have been used with adolescent populations (Nasser & Overholser, 1999). Psychiatric evaluations and medical notes for all subjects were reviewed by the principal investigator to assess the lethality of the *suicide attempt* using the LSARS-II scale. LSARS-II scores for subjects in this study were assessed based on detailed information about the medical lethality and circumstances of the *suicide attempt* found in both the psychiatric evaluation and medical documentation. To enhance the reliability of the assessment tool, a research assistant also independently rated the lethality of the *suicide attempt* for 50% of the subjects. The raters agreed on 85% of lethality scores and discussed the remaining 15% to make a joint decision on the rating.

Psychiatric diagnoses were recorded in the chart as *DSM-IV-TR* diagnoses (American Psychiatric Association, 2000). Diagnoses were made by hospital clinicians (licensed clinical social workers, psychologists, or psychiatrists) from interviews with the patient following the *suicide attempt*. In the majority of cases, the clinician gathered additional information about patient symptomatology from family members and other collateral contacts involved in their treatment (i.e., therapists and psychiatrists) to aid the diagnostic process. In cases where the interviewer documented that the patient had a history of attention-deficit hyperactivity disorder or substance abuse disorder, those disorders were also coded as occurring. Diagnoses were categorized according to the following *DSM-IV-TR* disorder types: depressive, bipolar, mood disorder not otherwise specified, disruptive, substance abuse, anxiety, and other. Personality disorders and diagnoses that were not definitive, such as rule out diagnoses, were not included in analysis.

Statistical Analysis

Data analysis was conducted using STATA 11.0. Bivariate analyses used independent t tests to determine whether there were statistically significant differences in means of the LSARS-II scores for psychiatric diagnoses. Ordinary least squares regression was used to test two models. The first model tested independent variables of gender and psychiatric diagnoses on the dependent variable of lethality. The second model tested the same independent and dependent variables, and added psychiatric comorbidity patterns that were designated by interaction terms. White standard error adjustments were made using the STATA 11.0 cluster term to correct for correlations created by repeated observations for subjects (White, 1980).

Results

The sample included 85 boys (22.7%) and 290 girls (77.3%). Adolescents ranged from 13 to 18 years with a mean of 15.4 ($SD = 1.34$) years. The sample was predominantly Caucasian/White (250; 66.7%), with about a third non-White: Hispanic/Latino (56; 14.9%), African American/Black (36; 9.6%), Biracial (21; 5.6%), Other (8; 2.1%), and Asian (4; 1.1%). Ingestion/poisoning (327; 87.2%) was the leading *suicide attempt* method, followed by cutting (14; 3.73%), strangulation (12; 3.20%), hanging (10; 2.67%), jumping (7; 1.87%), suffocation (1; 0.27%), firearm (1; 0.27%), swallowing of object (1; 0.27%), electrocution

(1; 0.27%), and drowning (1; 0.27%). *Suicide attempt* lethality ranged from 0.0 to 10.0 ($\bar{x} = 2.88$; $SD = 1.56$) and was skewed left; however, a plot of the studentized residuals demonstrated no clear pattern. Taking the log and square root of the lethality variable (after adding 1 to the score) also made no changes in the pattern of the residuals. Therefore, there was no indication that the variable required transformation to be used in the regression model; using robust estimation was adequate to address the issue of heteroskedasticity of the residuals (White, 1980).

Independent t tests were used to examine relationships between lethality and psychiatric diagnoses. For each t test, one diagnostic category was compared to all others in the sample. The only significant relationship with lethality was the substance abuse category, as adolescent suicide attempters with a substance abuse diagnosis had higher lethality scores than attempters without the diagnosis. Examining lethality differences by comorbidity patterns yielded no significant findings.

Two regression models were tested to investigate the relationship between psychiatric diagnosis and lethality while controlling for gender (see Table 1). The first model contained psychiatric diagnoses and the second model included depressive disorder comorbidity patterns. In the first model, substance abuse was the only diagnostic predictor that had a significant relationship with lethality; in the second model, only substance abuse was significantly associated with higher lethality.

Discussion

In this study we examined whether specific psychiatric diagnoses and comorbidity patterns were related to the medical lethality of *suicide attempts* among adolescents presenting to an urban general hospital. To the authors' knowledge, this study used the largest sample size ($N = 375$) to date to examine this question. The findings demonstrate that certain psychiatric diagnoses are more common in adolescent suicide attempters, and others are indicative of higher medical lethality. Having a depressive disorder was the most common psychiatric diagnosis in this sample, supporting prior studies that indicate depression may be the most common disorder in adolescent suicide attempters (Fordwood et al., 2007; Kelly et al., 2001; Renaud et al., 2008). However, depression alone did not predict *suicide attempt* lethality in either bivariate or multivariate results of this study, which also supports prior study findings (Wetzler et al., 1996). Substance abuse was the only psychiatric diagnostic predictor of adolescent *suicide attempt* lethality in regression analyses. While it is not surprising that having a substance abuse diagnosis was predictive of *suicide attempts* of higher lethality, what was unexpected was that comorbid disruptive disorders and male gender were not predictive of higher lethality. Prior studies that examined the impact of psychiatric disorders on lethality have found disruptive disorders (Nasser & Overholser, 1999) and male gender (Beautrais, 2003) to be the predictors of higher lethality, neither of which were found in this study. While it is unclear why disruptive disorder comorbidity was not the predictor of *suicide attempt* lethality in this study, it can be postulated that the lack of structured diagnostic interviews may have contributed to this null finding. With respect to the absence of a significant relationship between gender and lethality, it is possible that gender differences in lethality did not emerge because there were no gender differences in methods

(Beautrais, 2003), as the large majority (87%) of adolescents in this study attempted suicide by ingestion. It is also plausible that the increase in the United States in the last decade of lethal *suicide attempt* methods by females of hanging, suffocation, and poisoning (Centers for Disease Control and Prevention, 2007) may have contributed to the absence of gender differences in *suicide attempt* lethality.

The results of this study highlight the importance of substance abuse as a risk factor for lethal *suicide attempts* in adolescents and, taken with recent research findings on the relationship between lethality, intent, and psychiatric diagnosis, stimulates critical thinking around the understanding of suicidal behavior in youth. In a 15-year prospective study of 180 formerly psychiatrically hospitalized adolescent suicide attempters by Sapyta et al. (2012), the highest level of suicidal intent and most severe lethality of *suicide attempt* were not predictive of subsequent *suicide attempts* after controlling for psychiatric diagnoses. However, having a substance abuse diagnosis was predictive of subsequent *suicide attempts* in this study. Interestingly, this study found suicidal intent to be associated with *suicide attempt* lethality in early adulthood only; this relationship was not significant for adolescent attempters. This is an important finding that supports the notion that adolescents do not have the same knowledge of lethality of different *suicide attempt* methods as adults (Nasser & Overholser, 1999), and that there are characteristics other than suicidal intent that put adolescents at risk for completed suicide. We can posit that there are other factors that put adolescents at risk for lethal *suicide attempts*, such as having a substance abuse disorder, being impaired by substances at the time of attempt, and having access to lethal means (Brent, Perper, & All-man, 1987).

These findings also stimulate thinking about the development and implementation of treatment strategies for suicidal adolescents with substance abuse disorders. Treatment programs for suicidal adolescents typically only cursorily address substance abuse issues because of clinical, administrative, and economic constraints (Hawkins, 2009; King, Gaines, Lambert, Summerfelt, & Bickman, 2000). Suicidal adolescents with substance abuse problems can be especially challenging for clinicians because of their multiple treatment needs (Goldston, Curry, Wells, & Roley, 2011), suggesting the importance of implementing integrated services (Esposito-Smythers & Goldston, 2008; Libby & Riggs, 2005) rather than conducting serial or parallel treatment with these youth (Hawkins, 2009). In the first randomized clinical trial of an integrated cognitive-behavioral intervention for substance abuse and suicidality in adolescents, Esposito-Smythers, Spirito, Kahler, Hunt, and Monti (2011) found that adolescents who received the integrated intervention showed significant improvement in both substance use and suicidality outcomes when compared to adolescents who received enhanced treatment-as-usual. Despite the potential for integrated interventions for suicidal youth with substance abuse disorders, current service systems are generally inadequately prepared to meet adolescent substance abuse treatment needs because of multiple clinical, administrative, financial, and policy barriers (Hawkins, 2009; Libby & Riggs, 2005). Therefore, there is a distinct need for the development of more cost-effective treatment strategies for suicidal adolescents with substance use problems that can be implemented in a variety of care settings.

Limitations

There are some methodological limitations in this study, suggesting a cautious interpretation of the results. It was not possible to use structured interviews to determine psychiatric diagnoses. Instead, diagnoses were made by hospital clinicians from interviews with the patient following the *suicide attempt*. Although diagnoses were made in accordance with *DSM-IV-TR* criteria, this assessment procedure may lead to a certain degree of diagnostic uncertainty. Another limitation was that the sample size for all ethnicities other than Caucasian/White was not large enough to make multivariate statistical comparisons. Finally, it was not possible to examine other psychosocial risk factors for *suicide attempts* of high lethality and suicide completion in adolescents, such as precipitating events (Beautrais, 2003), prior suicidal acts (Renaud et al., 2008), suicidal intent (Nasser & Overholser, 1999), availability of lethal agents (Conner et al., 2011), and intoxication at the time of attempt (Brent et al., 1987), therefore limiting the explanatory power of the regression models in this study.

Future Research

Because the results of this study suggest that adolescents with a substance abuse diagnosis may be at greatest risk for lethal *suicide attempts*, treatment outcome research should focus on this subset of the adolescent population (Esposito-Smythers & Goldston, 2008). Despite the strong association between adolescent substance use and suicidal behavior in general, and specifically in relation to *suicide attempt* lethality as described in this study, few studies have investigated the effectiveness of combined treatment for these two problems (Conason, Oquendo, & Sher, 2006). While it is argued that integrated treatment strategies for this population are critical, research in this area is lacking (Goldston et al., 2011) and further testing of integrated treatment protocols is warranted (Esposito-Smythers et al., 2011). In sum, by targeting the high risk population of adolescent suicide attempters that use substances, we can develop interventions that, on the whole, may be more effective in addressing the problem of adolescent suicide.

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TABLE 1
Regression Coefficients for LSARS-II by Diagnostic Category and Comorbidity Pattern
(*N* = 375)

Diagnostic category	Lethality (Model 1)		Lethality (Model 2)	
	β	SE	β	SE
Male gender	.20	.23	.19	.24
Depressive (<i>n</i> = 272)	-.05	.18	.16	.27
Disruptive (<i>n</i> = 135)	-.15	.18	-.06	.29
Substance abuse (<i>n</i> = 106)	.48**	.17	.59*	.29
Anxiety (<i>n</i> = 61)	.13	.20	.59	.42
Depressive $\times$ Disruptive (<i>n</i> = 52)			-.09	.37
Depressive $\times$ Substance Abuse (<i>n</i> = 34)			-.19	.36
Depressive $\times$ Anxiety (<i>n</i> = 45)			-.61	.48
<i>F</i>	1.89		1.32	
<i>R</i> ²	.02		.02	

LSARS-II, Lethality of Suicide Attempt Rating Scale II.

*
 $p < .05$,

**
 $p < .01$.