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EVALUATING THE PREDICTIVE VALIDITY OF SUICIDAL INTENT AND MEDICAL LETHALITY IN YOUTH

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Abstract

Objectives—To examine whether suicidal intent and medical lethality of past suicide attempts are predictive of future attempts, the association between intent and lethality, and the consistency of these characteristics across repeated attempts among youth.

Method—Suicide attempts in a 15-year prospective study of 180 formerly psychiatrically hospitalized adolescents ($M_{age\ at\ hospitalization}$ = 14.83; 51% female; 80% Caucasian) were characterized using the Subjective Intent Rating Scale and Lethality of Attempt Rating Scale. Anderson-Gill recurrent events survival models and generalized estimating equations were used to assess predictive validity. Generalized linear models were used to examine stability of characteristics across attempts.

Results—Neither intent nor lethality from the most recent attempt predicted future attempts. The highest level of intent and most severe lethality of attempts during the follow-up predicted subsequent attempts, but the degree to which highest intent and most severe lethality contributed to prediction after considering methods of suicide attempts, past number of attempts, or psychiatric diagnoses was mixed. Across successive attempts, there was little consistency in reported characteristics. Intent and lethality were related to each other only for attempts occurring in early adulthood.

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Conclusions—Highest intent and lethality were better predictors of future attempts than intent and lethality of the most recent attempt. However, these characteristics should only be considered as predictors within the context of other factors. For youth, clinicians should not infer true intent from the lethality of attempts, nor assume that characteristics of future suicide attempts will be similar to previous attempts.

Keywords

suicidal ideation; suicide attempt; adolescence

Suicidal behavior is a major public health problem among adolescents and young adults (Garrett Lee Smith Memorial Act, 2004). There is much diversity in the presentation of suicide attempters and the developmental trajectories that culminate in these behaviors (Goldston et al., 1996, 1998, 2009; Mandell, Goldston, & Walrath, 2006). This diversity in the contexts and paths to suicidal behavior, together with the base rate of suicidal behavior, make it difficult to predict suicide attempts on an individual basis (Pokorny, 1983). To improve prediction, clinicians and researchers have considered the possibility that clinical characteristics of previous suicide attempts such as the degree of intention to die or the seriousness of the medical consequences (i.e., “lethality”) resulting from attempts might be associated with risk for later suicidal behavior (Goldston, 2003). In a survey of 256 psychologists, for instance, “medical seriousness of previous suicide attempts” was rated as the most important indicant of risk of future suicide out of 48 factors examined (Peruzzi & Bongar, 1999). However, the evidence regarding the predictive validity of these clinical characteristics is scant and mixed (e.g., Brown, 2002), particularly among adolescents and young adults (Goldston, 2003). In this regard, the Treatment of Adolescent Suicide Attempters (TASA) open trial for depressed and suicidal adolescents recently reported that the intent and lethality of the suicide attempt just prior to treatment entry was not predictive of future attempts (Brent, et al., 2009).

Related to this issue of predictive validity, there is a subgroup of especially high-risk individuals who have attempted suicide on two or more occasions. When considering the likelihood of future suicidal behavior for youth with multiple attempts, it is not clear whether a clinician should consider primarily the characteristics of the most recent suicide attempt or give equal or more weight to the individual’s previous history of suicidal behavior, such as the suicide attempt with most severe characteristics (i.e., highest degree of intent or most severe medical lethality). Beck and colleagues found that among a large sample of adult outpatients, the most severe level of suicide ideation ever experienced was a better predictor of eventual death by suicide than the current levels of suicide ideation at the intake evaluation (Beck, Brown, Steer, Dahlsgaard, & Grisham, 1999). Similarly the most severe level of suicidal plans was found to be a stronger predictor of eventual suicide than current plans or desire to make a suicide attempt among outpatients with suicide ideation (Joiner, Steer, Brown, Beck, Pettit, & Rudd, 2003). From a behavioral perspective, individuals who have engaged in suicidal behavior with high intention to die, or severe medical consequences have at the very least evidenced the capacity for serious self-destructive behavior. Experience with episodes of acute intent or lethality may lead to an acquired capability of engaging in more frequent subsequent suicidal behavior or eventual completed suicide (Joiner, 2005). However, this hypothesis has not had support yet in youth populations. For example, in the TASA study, Brent et al. (2009) found lower maximum levels of lethality of attempts among depressed and suicidal adolescents were predictive of new attempts within six months.

Despite the clinical assumption that a current attempt’s suicidal characteristics likely will reflect the characteristics of subsequent attempts, little confirmatory research has been done

to investigate the degree of temporal stability of intent and medical lethality across multiple suicide attempts. If clinical characteristics are not stable across attempts, the clinical usefulness of the most recent attempt predicting subsequent behavior should be questioned. One of the few studies to examine stability of suicide intent was a cross-sectional, retrospective study of adults diagnosed with bipolar disorder (Michaelis et al., 2003). In that study, there was a correlation of $r = .48$ between the intent of the first and second suicide attempts, and a higher correlation of $r = .74$ between the intent of the second and third attempts. Nonetheless, it is not clear that such a high degree of consistency would be evidenced in prospective studies of individuals with a greater diversity of psychiatric presentations.

Finally, another common assumption is that greater medical lethality of a suicide attempt reflects greater suicide intent, and vice versa, because of the presumed robust association between these two constructs. The relationship between intent and medical lethality within the same suicide attempt, however, has been inconsistent in studies with young people (DeMaso, Ross, & Beardslee, 1994; Lewinsohn, Rohde, & Seeley, 1996; Nasser & Overholser, 1999; Plutchik, van Praag, Picard, Conte, & Korn, 1989). One reason for inconsistencies could be that adolescents may be less informed regarding the medical consequences of their actions than older individuals, which would attenuate any correlation between their true intent and the resulting lethality from their selected method (Brown, Henriques, Sosdjan, & Beck, 2004; Harris & Meyers, 1997; Meyers, Otto, Harris, Diaco, & Moreno, 1992).

Considering the current understanding of these constructs in the literature, the present study focuses on the clinical characteristics of recent and past suicide attempts in the prediction of subsequent suicidal behavior. For this purpose, we have been conducting a 15-year, prospective naturalistic study of formerly psychiatrically hospitalized adolescents through early adulthood. This study provides an opportunity to evaluate more rigorously the predictive utility and interrelationship between clinical characteristics of suicidal behaviors. In the context of this longitudinal study, we addressed four related questions. First, to what extent are intent and lethality of the most recent suicide attempt predictive of future suicide attempts? Second, to what degree are the historically highest intent and most severe lethality predictive of future attempts? Third, to what degree are intent and lethality stable across repeated suicide attempts? Fourth, to what extent are intent and lethality of suicide attempts correlated within episode and does the magnitude of this association differ between episodes in adolescence and young adulthood?

Methods

Participants

The 180 participants in this prospective, repeated assessments study were recruited from consecutive discharges to an adolescent psychiatric inpatient unit between September 1991 and April 1995. Participants were not chosen on the basis of their history of suicidal behavior. The inclusion criteria were as follows: (1) 12 to 19 years of age at index hospitalization; (2) hospital length of stay of 10 or more days (average national length of stay at the time the study was 23.6 days; National Association of Psychiatric Health Systems, 1991); (3) ability to cooperate with and complete the assessments in the hospital; and (4) residence in North Carolina or Virginia at time of recruitment. Exclusion criteria were: (1) serious physical disease; (2) evidence of mental retardation; and (3) having a sibling already enrolled in the study.

Recruitment for this study occurred over four years and participants who entered the study at the beginning of recruitment have been followed for a longer period than participants

recruited at the end of the recruitment. We attempted contact with 225 adolescents and their parents or legal guardians approximately one-half year following discharge from the hospital. One youth died of cardiac problems prior to recruitment. We were able to contact 96.0% of the remaining sample; of these, 83.7% (n = 180) adolescents and families agreed to participate. The sample consisted of 91 girls and 89 boys; 80% were Caucasian, 16.7% were African American, and the remainder were Hispanic, Native American, or Asian American. The mean age of participants was 14 years, 10 months (SD = 1 year, 7 months; range: 12 years, 0 months to 18 years, 5 months) at their index hospitalization. Sixteen percent of youths were in the custody of the Department of Social Services at study entry. Of the remaining families, the socioeconomic status as classified by the Hollingshead (1957) index from highest to lowest was I: 3.3%, II: 12.6%, III: 21.9%, IV: 29.8%, and V: 32.4%.

As of August 1st, 2007, participants had been followed up to 15 years (M = 12 years, 7 months; SD = 4 years, 1 month). The mean age of participants at last assessment was 27 years, 6 months (SD = 4 years, 6 months; range 12 years, 11 months – 33 years, 1 month). By this cutoff, a cumulative 10% (n = 19) of the sample had dropped out of the study, and 3.3% (n = 6) of participants had died, but none had died due to suicide. An additional six participants (3.3%) were administratively withdrawn from the study because of lost contact and unknown location. As reported previously (Goldston et al., 2009), individuals who died or asked to be withdrawn from the study did not differ from the remaining participants in age at the index hospitalization, gender, or number of suicide attempts at the index hospitalization, but they were more likely to be Caucasian.

Adolescents were assessed at their index hospitalization. Subsequent assessments were initially scheduled every six to eight months at the beginning of the study, and then tapered to every ten to twelve months. In practice, the interval between follow-up assessments varied within and between participants due to their schedules and preferences, staff shortages, and occasions when participants moved without providing new contact information (in such cases, we continued trying to locate participants). The total number of assessments by the cut-off date for this report was 2,096. The average number of research assessments for active participants was 11.6 (SD = 4.7). This study retains ongoing approval from the respective Institutional Review Boards of the first four authors. Other publications from this study have focused on psychiatric and cognitive predictors of subsequent suicidal behavior, developmental changes in the relationship between psychiatric disorders and suicide attempts, state and trait characteristics of risk factors for suicidal attempts, anger and anger expression over the follow-up in relation to suicide attempts, and aftercare and re-hospitalization (Arnold et al., 2003; Daniel, Goldston, Erkanli, Franklin, & Mayfield, 2009; Goldston et al., 1999, 2001, 2003, 2009; Goldston, Reboussin, & Daniel, 2006).

Interviewers and coders of the clinical characteristics of suicide attempts were master's- and doctoral-level mental health professionals with experience in interviewing and/or treating suicidal individuals. Specific information on coding methods and interrater reliability are described below by instrument.

Instruments

Assessment of Suicide Attempts—Suicide thoughts and attempts were assessed with the standardized questions of the Interview Schedule for Children and Adolescents (ISCA; Kovacs, 1989; Kovacs, Pollock, & Krol, 1997; Sherrill & Kovacs, 2000), and the adult version of this interview, the Follow-Up Interview Schedule for Adults (FISA; Kovacs, Pollock, & Krol, 1995). At the index hospitalization, the attempts were assessed with the ISCA. During follow-up assessments, the ISCA was administered to adolescents and an adult informant (typically a parent) until the adolescent was age 18 or living as an independent adult. Following their 18th birthday, participants were administered the FISA.

The ISCA and FISA were administered by trained master's- and doctoral-level mental health professionals.

Consistent with contemporary systems for the classifications of suicidal behaviors (Posner, Oquendo, Gould, Stanley, & Davies, 2007; Silverman, Berman, Sanddal, O'Carroll P, & Joiner, 2007), a suicide attempt was defined as a potentially self-injurious behavior associated with at least some degree of psychological intent to end one's life. Self-harm behaviors (e.g., cutting on oneself) not associated with intent to kill oneself were not considered to be a suicide attempt. Two interrater reliability trials have indicated very high levels of agreement (Cohen kappa ≥0.90 for each) regarding the presence of a suicide attempt as assessed with the ISCA (Goldston et al., 2001; Kovacs, 1981).

At index hospitalization, supplementary information regarding suicide attempts was obtained from all available sources including medical records and parent interviews. During the follow-up, additional information about dates and medical lethality of suicide attempts was obtained when available from treatment notes and other records. When precise dates of suicide attempts were not available, the dates were estimated using the method of the "midpoint" rule (Kovacs, Feinberg, Crouse-Novak, Paulauskas, & Finkelstein, 1984). The onset was operationally defined as the midpoint of the defined window of time (e.g., "sometime in July" would be coded July 16th). Because parents are often not aware of adolescents' suicide attempts (Breton, Tousignant, Bergeron, & Berthiaume, 2002; Foley, Goldston, Costello, & Angold, 2006; Velez & Cohen, 1988; Walker, Moreau, & Weissman, 1990), adolescent reports generally were relied upon most heavily.

Assessment of Intent

The primary measure of intent was *Subjective Intent Rating Scale (SIRS)*, a simple 4-point scale for rating degree to which a respondent reported wishing to die at the time of a suicide attempt (see Table 1). The scale captures intent ranging from "Mild" (the respondent acknowledges a wish to die, but mainly wants to live) to "Very High" intent (the respondent expresses very little ambivalence about wanting to die). This measure was developed for this study to avoid the confounding of suicide intent with impulsivity or other factors potentially related to medical lethality such as precautions against discovery, timing of suicide attempt to prevent discovery, and isolation at the time of attempt. We examined the interrater reliability of the intent ratings of suicide attempts within two weeks of hospitalization and over the follow-up period (n = 197). There was a high level of agreement among coders for suicidal intent (ICC = 0.99, $p < .001$).

We used Beck's Suicide Intent Scale (SIS; Beck, Schuyler, & Herman, 1974) to help establish concurrent validity of the SIRS for a subset of suicide attempts over the follow-up (n=119). The SIS includes items assessing the objective circumstances of suicide attempts (e.g., isolation, timing to avoid intervention, precautions against discovery) as well as the subjective intent and expectations regarding death (e.g., conception of whether or not the attempt was likely to result in rescue, attitude toward wanting to die, communication of intent, premeditation). Although developed for use with adults, the SIS has been recommended as appropriate for research with adolescents (Steer & Beck, 1988). It was expected that the SIRS would be more highly related to the SIS-Subjective index than to the SIS-Objective index, because the latter tapped into factors such as discoverability of attempt, presumed to be related to lethality. In these validity tests, we used Spearman Rank Correlation (Rho) to determine the relationship between the unweighted SIS total and scale scores, and the SIRS scores for suicide attempts during the follow-up. The SIRS was found to be related to the SIS Total (Rho = 0.42; $p < 0.0001$), SIS-Subjective (Rho = 0.56; $p < 0.0001$), but not to SIS-Objective (Rho= 0.15; $p = .10$).

Assessment of Medical Lethality

The medical lethality of suicide attempts over the follow-up was rated with the Lethality of Suicide Attempt Rating Scale (Berman, Shepherd, Silverman, 2003; Smith, Conroy, & Eller, 1984; See Table 2). On this scale, suicide attempts are rated in medical lethality from 0 ("death is an impossibility") to 10 ("death is almost a certainty"). The scale is supplemented by tables describing the lethality of different medications. This scale has been used both in a community-based longitudinal study and with clinically ascertained adolescents, has been shown to have high inter-rater reliability and excellent six-month test-retest reliability, and has evidence of concurrent validity (Lewinsohn et al., 1993, 1996; Nasser & Overholser, 1999). Additional rating rules were created to aid in the reliability of ratings, such as how to factor in various medical interventions (e.g., receiving charcoal, being medically hospitalized, being admitted to ICU) or how to code vague attempts (e.g., "took pills" but no additional information). Similar to intent, we examined the interrater reliability for the medical lethality of suicide attempts at hospitalization and over the follow-up period (n = 197). A high level of agreement was demonstrated among coders for ratings (ICC = 0.95, p < .001). Consistent with our conceptualization of suicide intent, level of medical lethality was not considered when determining whether self-harm behaviors were suicide attempts.

Assessment of Psychiatric Disorders

The methods in the study for assessing symptoms of psychiatric disorders have been described extensively in previous papers (e.g., Goldston, 2009). In brief, semistructured clinical interviews for adolescents (ISCA; Sherrill & Kovacs, 2000) and adults (FISA; Kovacs, Pollock, & Krol, 1995) were used to assess the presence and absence of symptoms of psychiatric disorders, and their onset and offset dates over the follow-up. Psychiatric diagnoses were assigned when participants met full diagnostic criteria of psychiatric disorders. The diagnoses were "offset" when participants were asymptomatic for two months (or six months in the case of conduct disorder, or 12 months in the case of substance use disorder). When participants continued to evidence symptoms of the disorder, but no longer met full diagnostic criteria, they were considered to be in "partial remission." For purposes of statistical analyses, participants were still considered to be in episodes of disorder when they were in partial remission. Until the year 2000, diagnoses were assigned in accordance with Diagnostic and Statistical Manual of Mental Disorders (3rd ed., rev.; DSM–III–R; American Psychiatric Association, 1987) criteria. After publication of the Diagnostic and Statistical Manual of Mental Disorders (4th ed., text rev.; DSM–IV–TR; American Psychiatric Association, 2000), diagnoses were reviewed and updated to be in accord with new diagnostic criteria, and all new diagnoses were assigned on the basis of DSM–IV–TR criteria. In the current study, we specifically examined seven disorders that previously were found to be related to risk of suicide attempts over the follow-up (Goldston et al., 2009): major depressive disorder, dysthymic disorder, generalized anxiety disorder, panic disorder, attention deficit hyperactivity disorder, conduct disorder, and substance use disorder.

Suicide Deaths

To determine whether participants with whom we had lost contact had died, we conducted searches of the publicly available Social Security Death Index. No evidence was found that any participants had died, by suicide or other reasons, other than the participants of whom we were already aware (previously described).

Statistical Methods

The suicidal behavior that resulted in the index hospitalization may not be typical of all suicide attempts by participants. Hence, to guard against possible bias, we analyzed data

from suicide attempts that occurred after the index hospitalization, i.e., the suicide attempts that were "observed" or reported at the repeated assessments during the follow-up.

Andersen-Gill recurrent events models were used to examine whether the intent and lethality of suicide attempts during the follow-up were predictive of time until a subsequent suicide attempt (Andersen & Gill, 1982). Andersen-Gill models are an extension of Cox regression survival models, and this approach is ideal for modeling time to repeated events such as multiple suicide attempts by some in this sample. Andersen-Gill recurrent events models have been used to examine risk for repeated suicide attempts in this sample (Daniel et al., 2009; Goldston et al., 2009), as well as other recurrent health outcomes such as hospitalizations, cardiovascular events, and remission of obsessive-compulsive disorder (Dunlay et al., 2009; Kempe et al., 2007; Whang et al., 2005). For the survival models reported in this paper, time (i.e., increasing age) until suicide attempts was the dependent variable. This variable had a "start date" equivalent to the chronological age of adolescent participants on the date that they were discharged from their index hospitalization. The intent and lethality of the suicide attempts were time-varying covariates that were used to predict future attempts. With every new suicide attempt, the time varying covariates changed to reflect the new intent and lethality values. The analyses included race/ethnicity and gender as fixed covariates.

For individuals that made more than one suicide attempt during the follow-up, Andersen-Gill recurrent events models also were used to examine the predictive validity of an individual's highest intent or maximum lethality to date on subsequent suicide attempts. Hence, when a participant had two suicide attempts during the follow-up, the highest intent and lethality values for those two attempts were included as time-varying covariates in separate analyses predicting time until future attempts. When participants made subsequent attempts, the time-varying covariate value was updated to reflect any change to the maximum intent and maximum lethality of attempts observed to date.

When a clinical characteristic was found to predict subsequent suicide attempts, we further explored its predictive utility by controlling for other known predictors of suicide attempts. Separate Andersen-Gill models were used to examine these characteristics when controlling for number of prior suicide attempts, methods of suicide attempts (ingestion/overdose, cutting, or some other method) or major psychiatric disorders found previously in the sample to be related to future suicide attempts (Goldston et al., 2009). In these separate analyses, the number of prior suicide attempts (which changed with each successive attempt), the methods of last suicide attempt, and the presence or absence of psychiatric disorders during the present time period were considered to be time-varying covariates.

Generalized estimating equations (GEE) for logistic regression were used to assess the optimal cut-off for predicting risk for subsequent suicide attempts on the clinical characteristics found to be predictive of subsequent suicide attempts. The optimal cut-off was that threshold value on a respective scale that maximized sensitivity, specificity, and the odds ratios predicting subsequent suicide attempt status.

For examinations of the stability of clinical characteristics in successive suicide attempts, we used generalized linear mixed models. These models were used to examine the association (intraclass correlation coefficients, or ICC values) between intent values of successive pairs of suicide attempts. Similar methods were used to examine stability of lethality across successive suicide attempts.

Finally, GEE models were used to examine the association of lethality and intent within the same episode and whether this differed between adolescence and early adulthood. In preliminary analyses the age of 20 was identified as a cut-point that yielded an adequate

number of suicide attempts at each developmental period for analyses. Therefore, all suicide attempts after participants turned 20 years of age were considered occurring in early adulthood.

Results

Fifty-eight participants made a total of 144 suicide attempts during the post hospitalization follow-up. The primary methods for attempted suicide were incidents involving substance ingestion/overdose (n = 68) and stabbing/cutting/piercing (n = 52) (other methods, n = 24). Twenty-three participants made only a single suicide attempt, 18 participants made two suicide attempts during the follow-up, 12 participants made 3 or 4 suicide attempts, and five participants made from 5 to 12 suicide attempts during the study period. The unweighted average of all intent values was 2.49 (range: 1 – 4; *SD* = 0.92), and the average of the highest intent values was 2.72 (range: 1 – 4; *SD* = 0.89). The unweighted average of all lethality values was 2.74 (range: 0 – 9; *SD* = 1.88) and the average most severe lethality value for participants was 3.53 (range: 1 – 9; *SD* = 2.05).

The average lethality value reflected the fact that most of the suicide attempts among these young people were in the range of low to moderate lethality, similar to the range of lethality scores for suicide attempts by adolescents in both epidemiologic (Lewinsohn, Rohde, & Seeley, 1994) and clinical samples (Diamond et al., 2005, Handwerk, Larzelere, Friman, & Mitchell, 1998). The SIRS had not been administered previously, but we were able to compare scores on the Beck SIS for a portion of suicide attempts during the follow-up to other studies. The unweighted average of intent scores from this sample was 11.88 (SD = 6.88), similar to the range of suicide intent scores reported for suicide attempts by adolescents in other clinical samples (Shaunesey, Cohen, Plummer, & Berman, 1993; Spirito, Boergers, Donaldson, Bishop, & Lewander, 2002; Spirito, Valeri, Boergers, & Donaldson, 2003).

In the recurrent events models evaluating the predictive validity of intent and lethality of the last observed suicide attempt, the medical lethality of the most recent attempt was not found to be related to the time until subsequent suicide attempts (p = .66). Similarly, the results of recurrent event models indicated that the intent of the most recent attempt was not predictive of the time until future suicide attempts (p = .82).

When evaluating the predictive validity of the highest lethality and most severe intent, the findings were more robust. Maximum intent of prior attempts was found to be predictive of subsequent suicide attempts (b = 0.749, se = 0.222, HR = 2.12, p <.001). Maximum lethality of previous suicide attempts also was found to be positively associated with the occurrence of subsequent attempts (b = 0.253, se = 0.095, HR = 1.29, p < .01).

Maximum values of intent also were predictive of future attempts even after considering the number of prior attempts (b = 0.655, se = 0.237, HR = 1.93, p < .01). In this model, number of prior attempts also was related to future attempts (b = 0.102, se = 0.030, HR = 1.12, p < .001). However, maximum medical lethality became marginally related to time until future suicide attempts after considering number of past attempts (b = 0.179, se = 0.098, HR = 1.20, p = .09). In this model, number of prior attempts also was marginally related to future attempts (b = 0.093, se = 0.050, HR = 1.10, p = .06).

When controlling for attempt method, maximum lethality and intent both were reliably related to later suicide attempts in separate models (maximum intent: b = 0.821, se = 0.214, HR=2.27, p < .001; maximum lethality: b=0.298, se = 0.096, HR=1.35, p =.002). In these models, the methods of suicide attempts were not related to later attempts (maximum intent

model – ingestion/overdose: $p = .57$, cutting/stabbing; $p = .15$; maximum lethality model – ingestion/overdose: $p = .68$, stabbing/cutting: $p = .14$).

When controlling for psychiatric diagnoses, highest intent ($b = 0.034$, $se = 0.075$, $HR = 1.04$, $p = 0.65$) was not related to subsequent suicide attempts. By contrast, in this model, five psychiatric diagnoses were predictive (Major Depression: $b = 2.228$, $se = 0.842$, $HR = 9.28$, $p < .01$; Dysthymic Disorder: $b = 3.279$, $se = 0.535$, $HR = 26.54$, $p < .001$; Generalized Anxiety Disorder: $b = 2.923$, $se = 0.647$, $HR = 18.59$, $p < .001$; Conduct Disorder: $b = 2.964$, $se = 1.212$, $HR = 19.37$, $p = .01$; Substance Abuse: $b = 1.340$, $se = 0.566$, $HR = 3.82$, $p = .02$). Similarly, maximum lethality ($b = 0.113$, $se = 0.194$, $HR = 1.12$, $p = 0.56$) was not predictive of subsequent suicide attempts after controlling for psychiatric diagnoses. Similarly in this model, the same five psychiatric diagnoses were predictive (Major Depression: $b = 2.320$, $se = 0.903$, $HR = 10.17$, $p = .01$; Dysthymic Disorder: $b = 3.144$, $se = 0.509$, $HR = 23.19$, $p < .001$; Generalized Anxiety Disorder: $b = 2.834$, $se = 0.571$, $HR = 17.02$, $p < .001$; Conduct Disorder: $b = 3.062$, $se = 1.447$, $HR = 21.37$, $p = .03$; Substance Abuse: $b = 1.280$, $se = 0.602$, $HR = 3.60$, $p = .03$).

We then attempted to identify clinically meaningful thresholds that could suggest a high likelihood for subsequent suicide attempts. For maximum intent values, there was no single cutoff value that was found to be optimal. The best identified cutoff, 4 and above, did not demonstrate significant predictive validity (sensitivity = 69%, specificity = 44%, b = 0.169, $se = 0.36$, $OR = 1.18$, $p < .63$). For most severe medical lethality, a cut-off score of 5 was found to have marginal utility in predicting later attempts (sensitivity = 70%, specificity = 45%, $b = 1.17$, $se = 0.41$, $OR = 3.22$, $p = .053$). Specifically, maximum lethality scores of 5 and above were slightly more than 3 times more likely to be associated with a subsequent attempt than 4 or below.

Our next set of questions focused on whether reported suicide intent and lethality were consistent across attempts of repeat attempters. ICC values were used to estimate the strength of association between intent and lethality values of successive suicide attempts over the follow-up. The ICC for intent across successive suicide attempts was 0.26, and the ICC for lethality values was 0.21, indicating low temporal stability for both clinical characteristics across successive suicide attempts among the youth in our sample.

Finally, we examined whether suicide intent and lethality of each suicide attempt were correlated within episode, after controlling for gender and race/ethnicity. We also examined whether the relationship between these characteristics was different when an attempt occurred in adolescence or young adulthood. In the GEE models for suicide attempts prior to the age of 20, lethality of suicide attempts was not found to be related to the intent of attempts ($X^2 = 1.49$, $p = .22$). Likewise, the reported intent of attempts was not significantly related to lethality of the same suicide attempts ($X^2 < 1.00$, $p = .34$). In contrast, lethality was related to intent of the same suicide attempts for attempts after the age of 20 ($b = 0.152$, $se = .039$, $X^2 = 15.53$, $p < .001$). Likewise, intent was predictive of lethality ($b = 0.781$, $se = .265$, $X^2 = 8.65$, $p < .003$).

Discussion

In this prospective study of a previously hospitalized sample of young people, we tracked suicide attempts and their clinical characteristics over a period of more than 15 years to examine several assumptions regarding the clinical utility of assessing intent and medical lethality of suicide attempts. There have been few prospective studies examining these characteristics in regard to their interrelationship and predictive utility in adolescents and young adults.

It has been commonly assumed among clinicians that clinical characteristics of the most recent suicide attempt are important predictors of subsequent suicidal behavior (Peruzzi & Bongar, 1999). Nonetheless, the results of this study indicate that the intent and medical lethality of the most recent suicidal attempt did not predict time until subsequent suicidal behavior. This finding dovetails with findings from the TASA study: neither intent nor lethality of the attempt prior to treatment was associated with repeat attempts within six months after study entry (Brent, et al, 2009). Although clinicians often rely upon clinical characteristics of a recent suicide attempt in estimating risk of future suicidal behavior and making clinical decisions, these findings collectively raise questions about the predictive utility of this information among adolescents and young adults.

Based on research in adults indicating that the “worst ever” suicide characteristics among outpatients at treatment entry was predictive of later death by suicide (Beck et al., 1999; Joiner et al, 2003), we also prospectively examined the possibility that the most extreme lethality or reported intent of any suicide attempt might be a better predictor of subsequent attempts than merely the characteristics of the most recent attempt. To examine the most serious lethality and intent in this way, we “updated” the maximum lethality or intent of subsequent suicide attempts every time that a participant made a new suicide attempt with more extreme clinical characteristics.

Using this method, the results indicate that the most severe lethality and highest intent had better predictive validity of future suicide attempts than the clinical characteristics of the most recent attempt. Maximum intent continued to be predictive of subsequent attempts even after controlling for history of previous attempts and suicide method used. We note that suicide intent can be viewed as a form of suicide ideation, i.e., ideation about the certainty of intention to die while engaging in suicidal behavior. Given the finding in adults that outpatients’ most serious past suicide ideation predicted eventual death by suicide, it therefore is not surprising that the most severe intent also was predictive of repeat suicide attempts. Extreme suicidal intent, even among chronically suicidal individuals, is often fleeting and ephemeral (Freedenthal, 2007); therefore, assessing prior suicidal intent in terms of the historical peak might be more useful in predicting future behavior than assessing intent only from the last episode of suicidal behavior. As suggested by Joiner (2005), individuals that have a history of engaging in suicidal behavior with higher lethality or intent may have acquired an increased capability for future suicidal behavior due to habituation of the fear and pain associated with serious prior attempts.

The predictive validity of maximum medical lethality remained robust when controlling for method employed; however, the contribution of maximum medical lethality was only marginally significant after controlling for previous number of suicide attempts. In this latter model, previous number of suicide attempts also was marginally related to future attempts. This pattern of findings suggested a degree of multicollinearity between number of attempts and maximum lethality in prediction of future attempts. However, it also highlights the fact that the relationship between maximum lethality values and future attempts is not simply a reflection of increasing number of attempts. At the very least, this finding underscores the importance of restricting access to lethal means as a suicide prevention approach when working with adolescents and young adults that have made suicide attempts (Mann et al., 2005).

When controlling for presence of psychiatric diagnoses, neither maximum intent nor maximum lethality contributed further to the prediction of subsequent suicide attempts. Nonetheless, five clinical diagnoses remained significant predictors of future suicide attempts (Major Depression, Dysthymic Disorder, Generalized Anxiety Disorder, Conduct Disorder, and Substance Abuse). The findings suggest that although maximum intent and

lethality may be more useful when compared to current clinical characteristics, they may not add to the ability to predict future suicide attempts when carefully assessed information about psychiatric and substance use disorders is available.

Although increased intent was related to increased likelihood of subsequent suicide attempts, there was no single cut-off value for maximum intent with adequate sensitivity and specificity that might be useful as an optimal "short-hand" to clinicians as a discrete indicator of risk. Similarly, scores five or more on the lethality rating scale for the suicide attempt with most serious medical consequences (i.e., corresponding to a suicide attempt in which there is at least 50% chance of death without intervention) provided only marginal sensitivity in identifying individuals who would make further suicide attempts, and the use of this cut-off would result in a number of "false positives" due to relatively low specificity. These findings suggest that maximum intent and lethality value may be of some value to clinicians in identifying the most at-risk individuals, but certainly need to be considered within the context of other clinical information.

Among the participants that made repeated suicide attempts during the follow-up, we also examined the stability of intent and lethality across suicide attempts. If clinicians are to use these characteristics as predictors of subsequent behavior, it is important to determine if these characteristics are relatively stable over time. In this regard, it commonly is assumed that the best predictor of future behavior is past behavior, so it would make logical sense that there would be some consistency in clinical characteristics across the suicide attempts of individuals. Surprisingly among repeat attempters, we did not observe compelling evidence that there was any degree of stability between attempts for either intent or lethality. This lack of stability of clinical characteristics across attempts may be one of the reasons that the clinical characteristics of the most recent suicide attempt were not reliably related to later suicide attempts.

Finally, we examined the association between intent and lethality of suicide attempts. Clinicians sometimes assume that suicide attempts with greater medical lethality are also reflective of greater intent. Nonetheless, the findings from the child and adolescent literature regarding the relationship between intent and lethality have been inconsistent (DeMaso et al., 1994; Lewinsohn et al., 1996; Nasser & Overholser, 1999; Plutchik et al., 1989). In our sample we found that intent and lethality were not reliably associated among adolescents, but that there was a more reliable association between these clinical characteristics after participants reached young adulthood.

These developmental findings could be attributable in part to the fact that some youths are not as knowledgeable as older individuals about the potential medical consequences of certain self-destructive behaviors, such as the ingestion of certain substances (Brown et al., 2004). It could also be the case that there is greater variability in the relationship between intent and medical lethality at younger ages for other reasons. For example, some adolescents may have high intent, but may not have access to highly lethal means. Adolescents also may have certain expectations or cognitions that might drive their choice of methods, or they may feel constrained in choice of methods because they live with their parents who might be likely to discover them. Understanding the relationship between intent and lethality as a developmental phenomenon may help provide insight that would be important in developing age-appropriate suicide prevention interventions. Nonetheless, these findings underscore the fact that there is not a consistent relationship between intent and lethality, and that level of intent cannot be assumed or inferred from medical lethality. For clinicians, naturally, the use of lethal means will always be taken very seriously, but the use of lethal means in young adulthood appears to be more closely related to a strong desire to die when compared to younger attempters.

This is one of the few prospective studies to examine the predictive utility and interrelationship of the clinical characteristics of suicidal behavior, but the findings should be considered in the context of the limitations of the study. First, although we were able to follow a large group of youths over a long period of time and observed a diversity of developmental and psychiatric paths, the findings from this sample may not be generalizable to other youth and young adult populations. Second, we focused exclusively on suicide attempts occurring during the follow-up period to avoid concerns about possible lack of representativeness of suicide attempts that resulted in the index hospitalization. Although a total of 144 suicide attempts in all occurred during the follow-up by the cut-off date for this paper, the findings regarding the association of intent and lethality across multiple suicide attempts were based on the smaller sample of 35 participants that attempted suicide on more than a single occasion during the follow-up. Hence, these findings need to be replicated in other prospective, naturalistic studies. Third, in this study, we developed and used a new measure of subjective intent in an effort to disentangle the construct of intent from factors such as degree of planning, precautions, and discoverability of suicide attempts. The validity of this measure is evidenced by its relationships with the subjective intent items of the Suicide Intent Scale, and the predictive validity of the most severe intent scores. Nonetheless, this measure has not been used in other studies.

In sum, the current findings suggest that the historical “worst ever” intent and lethality of previous suicide attempts were superior to current intent and lethality in predicting subsequent suicidal behavior. Despite the potential clinical utility of “worst ever” intent and lethality, these variables should only be considered as potential indicators of risk in the context of other clinical information, given difficulties in predicting suicidal behaviors at an individual level. The clinical characteristics of most recent attempts were not reliably related to later attempts, and hence, clinicians should be cautious about reliance on this information in decision-making and in the prediction of future suicidal behavior. Moreover, clinicians should not infer intent from the medical consequences of attempts, nor assume that the clinical characteristics of future suicide attempts of individuals will be similar to those of past attempts. Additional prospective research is needed to further understand the trends and fluctuations of subsequent suicide attempt characteristics, controlling for both maturation processes within and moderators between individuals. Additional research also is needed to help better elucidate the mechanisms by which maximum lethality and intent of suicide attempts portend increased risk for future suicidal behavior.

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Table 1

Ratings and Behavior Anchors for the Subjective Intent Rating Scale (SIRS).

Numerical Rating	Severity	Description
4	Very High	There is little ambivalence surrounding the suicide attempt. The patient states that s/he nearly 100% wanted to die. The patient felt that the methods and preparations definitely were sufficient to result in death.
3	High	The patient wants to die more than not. The patient's perception is that s/he took steps (precautions or adequate methods) to ensure that the suicide attempt would result in death.
2	Moderate	The balance between the patient's wish to die and wish to live is roughly equal or ambiguous. It is not clear from the patient's perspective (as reflected in writings or statements to the clinician or others) whether s/he thought the act of self-harm had a high likelihood of death.
1	Mild	Patient has some intent to die but mostly wants to live. The patient primarily wants to accomplish something other than suicide (e.g., escape from problems or pain, or show others how s/he feels), although s/he partly wants to die and would not care if death was the result of this action.

Table 2

Ratings and Behavior Anchors for the Lethality of Suicide Attempt Rating Scale (LSARS).[a]

Numerical Rating	Criteria	Example
10.0	Death is reasonably certain.	Jumps off top of tall building or bridge.
9.0	Death is highly probable outcome without intervention of others. Actions done in private and some precautions that obscure or prevent discovery.	Takes hundreds of dangerous medications (e.g., OxyContin) and times the act when help ordinarily not immediately available. Makes no effort to communicate to others.
8.0	Death is probable without the intervention of others. Patient conducts actions in private or otherwise does not communicate intentions. However, actions committed with some reasonable risk for discovery.	Hangs self in jail with a sheet; found by guard turning blue, but hanging was attempted at height that might not be noticed by guard.
7.0	Death is probable without medical attention from patient or others. These means must also be done in a public way that is likely to be discovered or makes direct/indirect communication to others.	Ingests multiple pills with serious toxicity and makes severe lacerations on wrists, then immediately calls friend, who calls 911, resulting in emergency intervention
5.0	Life and death are equally likely or information gathered is vague/incomplete to make a determination.	Takes an unknown number of pills, walks down middle of divided highway (on double yellow line) with a high speed limit at night hoping to be hit by car (not intentionally jumping in front of cars).
3.5	Death improbable as long as patient or other person administers first aid. Patient performs act in public way (e.g., communicates to others) or otherwise takes no actions to hide self/injury.	Takes 40 aspirin with two beers; later, tries to vomit and then asks friend to drive to emergency room.
0	No possibility of death	Tries to cut wrist with dull knife, but skin not broken.

[a]Note: The above description is intended to orient the reader to conceptual differences among levels of LSARS. This is not intended to be a reference for its use. For further reference, see Smith et al. (1984) and a recent medication update in Berman et al. (2003).