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One-Year Follow-Up of Suicidal Adolescents: Parental History of Mental Health Problems and Time to Post-Hospitalization Attempt

Cheryl A. King,

Departments of Psychiatry and Psychology, Institute for Human Adjustment, University of Michigan, Ann Arbor, MI, USA

David C. R. Kerr,

Department of Psychology, Oregon State University, Corvallis, OR, USA

Michael N. Passarelli,

Department of Epidemiology, University of Washington, Seattle, WA, USA

Cynthia Ewell Foster, and

Department of Psychiatry, University of Michigan, Ann Arbor, MI, USA

Christopher R. Merchant

Department of Psychology, University of Michigan, Ann Arbor, MI, USA

Abstract

This longitudinal study of recently hospitalized suicidal youth examined parental mental health history in addition to several indices of adolescent functioning as risk factors for time-to-suicide attempt over a 1-year period. Participants were 352 adolescents (253 girls, 99 boys; ages 13–17 years) who participated in self-report and interview assessments within 1 week of hospitalization and 6 weeks, 3, 6, and 12 months post-hospitalization. Multivariable proportional hazards regression modeled time-to-suicide attempt. Results indicate that adolescents were almost twice as likely to make a suicide attempt if they had at least one biological parent with mental health problems. Risk was also increased for adolescents with baseline histories of multiple previous suicide attempts, more severe suicidal ideation and more severe functional impairment. Findings suggest the need to consider the family system when intervening with suicidal youth.

Keywords

Suicide attempts; Adolescents; Survival analysis

Introduction

Suicidal thoughts and suicide attempts are the most common mental health emergencies of adolescents (King et al. 2009b; Melzer-Lange and Lye 1997). This is not surprising given

[✉]Please address correspondence to Cheryl A. King, Ph.D., ABPP, Department of Psychiatry, Rachel Upjohn Building, 4250 Plymouth Road, University of Michigan, Ann Arbor, MI 48109-2700, kingca@umich.edu.

recent nationally representative data indicating that, in the preceding year, 14.5% of high school students seriously considered attempting suicide, 11.3% made a plan about how they would attempt suicide, 6.9% made one or more suicide attempts, and 2.0% were medically treated for a suicide attempt (CDC 2008). As a result, it is not unusual for parents of adolescents—and mental health professionals who work with adolescents—to be called upon to judge the level of an adolescent's suicide risk and respond appropriately.

Adolescents who have made suicide attempts or who have been psychiatrically hospitalized are a particularly high risk group. Nevertheless, relatively few longitudinal outcome studies exist. The available studies indicate that significant numbers of these adolescents, approximately 10–18%, attempt suicide within the first year following their hospitalization (Brent et al. 1993; Goldston et al. 1999; King et al. 1995), and approximately 25% attempt suicide within 5 years post-hospitalization (Goldston et al. 1999). These attempts are associated with significant morbidity and mortality (Gould et al. 2003).

Risk factors for adolescent suicide attempts include individual and social factors. Primary individual risk factors are history of suicide attempt, severity and frequency of suicidal thoughts, depressive disorders, alcohol and substance abuse, and conduct disorder (or a pattern of aggressive behavior) (as reviewed in Bridge et al. 2006). Social factors include social isolation and victimization via bullying, sexual abuse, or physical abuse (as reviewed in King and Merchant 2008). The existing evidence indicates that risk for suicide attempts and suicide is best conceptualized as multi-factorial.

The present study examines parental history of mental health problems in addition to adolescent factors, such as psychopathology, adaptive impairment, severity of suicidal ideation, and history of multiple suicide attempts, as predictors of suicide attempts in high risk adolescents. The study's conceptual framework is a developmental psychopathology model that conceptualizes adolescent suicidal behavior and related psychopathology as conditions that unfold over time (King 1997). Adolescence is characterized by specific developmental tasks (i.e., increasing independence), role requirements (i.e., student), and social contexts (i.e., family life). It is also a period characterized by increased prevalence rates for alcohol use and depressive disorders, two primary risk factors for suicide attempts (Gould et al. 2003). Making use of a transactional model of development (Sameroff and Chandler 1975) that considers multiple influences across time, it is possible to put the magnifying glass on a particular behavioral outcome. In this study, survival analyses are used to construct models that predict the time-to-suicide attempt in a large sample of acutely suicidal recently hospitalized youth. These models use time-varying covariates to take into account changes in the contributions of predictor variables over time.

Parental Psychopathology and Youth Suicide Risk

Parental mental health problems have long been known to convey risk to offspring for a number of negative outcomes including depression, anxiety, and behavioral problems (Radke-Yarrow and Klimes-Dougan 2002). Cross-sectional and longitudinal studies have found associations between adolescent suicidal behavior and a family history of suicidal behavior, parent-child discord, and family dysfunction (Brinkman-Sull et al. 2000; Spirito et al. 2003; Wagner 1997). Family dysfunction has not persisted as an independent longitudinal

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predictor of adolescent suicidal behavior, however, after individual level variables, such as hopelessness and depression, are controlled (Brinkman-Sull et al. 2000; Spirito et al. 2003). To our knowledge, only one previous prospective study of psychiatrically hospitalized adolescents has examined family history of psychiatric condition (suicidal behavior, substance abuse, affective disorder) as a predictor of suicide attempts (Brent et al. 1993). This study examined univariate associations and found no significant relationship between parental psychopathology and adolescent suicide attempt; however, only 13 adolescents in this study made a suicide attempt prior to follow-up, which limited statistical power. Thus, the relationship between adolescent suicide attempt and parental psychopathology has yet to be explored fully.

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Multiple mechanisms of influence may explain the relationship between parental mental health problems and adolescent suicidality. Parental psychopathology may influence adolescent suicide risk indirectly by contributing to youth psychopathology. Mood disorders, substance use disorders, and antisocial behavior (all of which increase risk for adolescent suicide attempt) are known to have a genetic component (e.g., Arseneault et al. 2003; Merikangas et al. 1998; Sullivan et al. 2000). Additionally, parental mental health problems impact offspring psychopathology and therefore suicide risk via environmental pathways, such as detrimental family circumstances (e.g., non-intact family, family discord, stressful events), poor parenting practices (e.g., harsh, inconsistent discipline, poor monitoring), and maltreatment (see Bridge et al. 2006). Finally, parental psychopathology may make additional contributions to poor outcomes in clinical populations via poor treatment adherence. For example, in a longitudinal study of suicidal adolescents, family dysfunction and less involved/affectionate fathers were linked with less follow-through with recommended psychotherapy, and mothers' self-reported hostility was associated with less follow through with recommended pharmacotherapy (King et al. 1997). There are several pathways by which parental mental health problems may impact adolescent suicide risk.

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Within-Adolescent Suicide Risk Factors

In addition to examining parental mental health history as a risk factor for youth suicide attempts, this study was designed to consider multivariate models. Based on previously published findings, within-adolescent factors, including history of multiple suicide attempts, severity of suicidal ideation, severity of depression and anxiety, and the presence of an alcohol or substance use disorder, were hypothesized to be meaningful predictors of post-hospitalization suicide attempts. These factors are explained here in more detail.

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Clinical and community-based studies indicate that adolescents with histories of multiple suicide attempts are at greater risk for future suicide attempts and tend to have more severe psychopathology (e.g., Goldston et al. 1998; Hawton et al. 1999; Rudd et al. 1996). In a large non-referred sample, adolescents with histories of multiple suicide attempts more often made a subsequent attempt across a 6 year follow-up than those with histories of a single attempt (Miranda et al. 2008). Furthermore, adolescents who had made multiple previous suicide attempts more often reported wishing to die, being uncertain or sorry about having recovered from their attempt, and planning their attempt so that intervention was unlikely (Miranda et al. 2008). In a sample recruited from an emergency department, those with a

history of multiple attempts were more likely than those with a single attempt history to have a mood or disruptive behavior disorder, and to report greater depression severity, affect dysregulation, hopelessness, and self-mutilation (Esposito et al. 2003). Thus, a history of multiple suicide attempts increases subsequent risk for suicide attempts and is associated with more severe ratings of psychopathology.

Suicidal ideation has also been closely associated with suicide attempts; Lewinsohn et al. (1996) found that 88% of suicide attempters reported suicidal ideation. In a community sample of adolescents, suicidal ideation at age 15 was associated with a 12-fold increase in the odds of a suicide attempt by age 30 (Reinherz et al. 2006). Even among adolescents hospitalized with acute suicide risk, the severity (frequency and specificity) of suicidal ideation confers ongoing suicide risk. Specifically, in one sample, suicidal ideation at initial hospitalization predicted a suicide attempt in the subsequent 6 (Huth-Bocks et al. 2007) and 15 months (Kerr et al. 2007). Prinstein et al. (2008) traced the course of suicidal thoughts among psychiatrically hospitalized suicidal adolescents in the 18 months following discharge. Although such thoughts tended to remit in the first 6 months, less marked decreases over time predicted later suicide attempt and a resurgence of suicidal thoughts occurred in the 9–18 months following hospitalization. These findings underscore the importance of continued follow-up.

Alcohol and substance abuse are also strong and consistent predictors of adolescent suicidal attempts and suicide. Studies with community samples of adolescents show that substance abuse is a strong predictor of suicide (Brent 1995; Shaffer et al. 1996) as well as suicide attempts (Andrews and Lewinsohn 1992), with substance use/dependence differentiating attempters and ideators (Gould et al. 1998). Wu et al. (2004) found that the association between alcohol abuse/dependence and suicide attempts was maintained even when controlling for demographic variables, psychiatric disorder (e.g., depression, anxiety, conduct disorder) and suicidal ideation.

The findings are mixed concerning depression and anxiety as predictors of suicide attempts among high risk adolescents. In a prospective study of 148 adolescents, King et al. (1995) found that dysthymia, severity of suicidal thoughts and family dysfunction were predictors of suicide attempts during the 6-months following hospitalization. In a similar study, Brent et al. (1993) found that, a history of a suicide attempt and affective disorders with nonaffective comorbidity were the strongest predictors of future attempts. In contrast, in a prospective, longitudinal study of 180 psychiatrically hospitalized adolescents, Goldston et al. (1999) found that the number of prior attempts was the strongest predictor of post-hospitalization attempts, with severity of depression and anxiety emerging as important risk factors only for youth with a prior suicide attempt. Depression, anxiety, and other forms of psychopathology were not strong predictors of attempt in an 18-month follow-up study of hospitalized adolescents (Prinstein et al. 2008); rather, baseline suicidal gestures and changes in suicidal ideation over time were the most robust predictors of future attempts. These studies suggest that suicide attempts are multi-determined and that patterns of change in risk factors over time are important.

Hypotheses

The present study used survival analyses to examine the extent to which the occurrence of a suicide attempt during the 1-year follow-up period could be meaningfully predicted by parental mental health history in addition to adolescents' history of multiple suicide attempts, suicidal ideation, and other baseline measures of adolescent functioning. We hypothesized that adolescents with biological parents (mothers and fathers) who reported a history of mental health problems (on the Family History Screen) would be more likely to attempt suicide. In keeping with previous studies, we also hypothesized that a history of multiple suicide attempts; severity of suicide ideation, anxiety, and depression; and alcohol/substance abuse would be predictors of time-to-attempt during the 1-year follow-up. In keeping with our developmental psychopathology framework, as well as relevant literature pointing to the multiple influences on adolescent suicidality, analyses were also conducted to examine interactions among these hypothesized predictors of time-to-attempt during follow-up.

Method

Sample

The study sample consisted of 352 adolescents, ages 13–17 years who were psychiatrically hospitalized for suicide ideation or attempt, at baseline, at either a university ($n = 99$) or private hospital ($n = 253$). The participating adolescents were predominately female (71.9%) with a mean age of 15.6 years ($SD = 1.3$). The racial/ethnic distribution was 86.5% Caucasian, 5.9% Black, and 7.6% other race/ethnicity. Eleven percent of participants were in families receiving public assistance. Regarding parental education: 10.2% of mothers and 10.1% of fathers had graduate/professional degrees, 19.5% of mothers and 14.7% of fathers had college degrees, 39.9% of mothers and 32.7% of fathers had some college education, 30.4% of mothers and 42.4% of fathers had high school degrees or less education.

These subjects were participants in the NIMH-funded Youth Support Team intervention (YST-II) trial for suicidal adolescents (www.clinicaltrials.gov), which examined a supplemental social support intervention for adolescents following psychiatric hospitalization (King et al. 2009a). Data were collected between November 2002 and December 2005. The study's inclusion criteria for acute suicide risk were met by parent or adolescent report of: (a) recent suicidal ideation that was *either* unrelenting *or* accompanied by a specific plan ("Did you think about killing yourself many times in the last four weeks?" or "Did you plan exactly how you would kill yourself?"); or (b) suicide attempt within the last 4 weeks; taken from the NIMH DISC-IV (Shaffer et al. 1998) Suicidal Ideation/Behavior section. For one case missing the DISC, the Suicidal Ideation Questionnaire-Junior response, "I thought about killing myself (almost every day) in the last month" was used. Exclusion criteria included: (a) severe cognitive impairment, (b) direct transfer to pediatric medical unit, (c) direct transfer to residential placement, (d) distance (>1 h travel), or (e) no legal guardian (e.g., awaiting court appointment). A full description of the intervention study design, recruitment and retention, and an analysis of the primary outcome data are available (King et al. 2009a).

In the present study, we restricted attention to the 352 adolescents (of 448 in the original study) who (1) had complete family history data for at least one biological parent, and (2) returned for at least one follow-up visit beyond baseline. No differences were observed between the 352 participants included in this report and the 96 excluded in terms of the primary demographic variables of interest (i.e., hospitalization site, age, sex, racial distribution, usage of public assistance, or either parent's level of education). Similarly, no differences between these groups were observed for baseline clinical characteristics (severity of suicidal ideation, depressive symptoms, internalizing or externalizing problems, and suicide attempt history).

Adolescents' self-reported lifetime suicide attempt histories (NIMH DISC-IV; DSM-IV criteria), inclusive of presenting events, were distributed as follows: Severe ideation/NoAttempt (NA; $n = 84$); Single Attempt (SA; $n = 129$); Multiple Attempts (MA; $n = 139$). Among adolescents who reported a suicide attempt in the past 4 weeks, the most recent methods included "cutting/slashing" ($n = 64$), overdose or ingestion of over the counter analgesics ($n = 51$), overdose or ingestion of prescription medications ($n = 56$), overdose or ingestion of unknown medication or substance ($n = 37$), jumping ($n = 7$), firearm ($n = 5$), hanging/strangulation ($n = 12$), and gas inhalation ($n = 1$).

The institutional IRB approved the study. Parents/guardians provided informed consent and youth provided informed assent. Adolescents were paid \$30 and parents/guardians were paid \$20 for participation. Forty-three percent of eligible adolescents who were approached for consent were recruited. There were no demographic differences by consent status.

Assessments and Measures

Suicide Attempts—The presence or absence of one or more suicide attempts during each follow-up period was coded as a dichotomous indicator, using suicidality items from the Mood Disorders module of the NIMH DISC-IV (DSM-IV criteria). A suicide attempt was indicated for a positive response to "Have you ever, in your whole life, tried to kill yourself or made a suicide attempt?" The time frame was adapted to capture data between assessments. If a suicide attempt was indicated over the course of the study by either adolescent or parent report, the month during which the event occurred was recorded (if there was a difference between the adolescent and parent report, the earlier of the 2 months was used).

Functional Impairment (Hodges 1996)—Parents were administered the Child and Adolescent Functional Assessment Scale (CAFAS) to assess their child's functional impairment. The CAFAS has demonstrated high test-retest reliability, construct validity, and predictive validity. Subscales used were: School/Work (functioning in group/educational setting); Home (observation of reasonable rules and performance of age appropriate tasks); Behavior Toward Others; Moods/Emotions. Inter-rater reliabilities were high (α range = .83–.98). Individual subscales are rated based on the adolescents' most severe level of dysfunction, selected from a number of options spanning severe (e.g., out of school or job due to behavior that occurred at school or on job), moderate, mild, or minimal/no impairment (graduated from high school or received GED). The CAFAS total score is a sum

of these scores (ranging from 0 to 180 at 10-point increments). Interviewers were trained by a certified trainer using six practice vignettes, followed by ten mock reliability vignettes. Inter-rater reliabilities were high (α range = .83–.98).

Family Psychiatric History (Weissman et al. 2000)—The 24-item Family History Screen (FHS) was used to assess the psychiatric histories of adolescents' biological parents at baseline. A biological parent or legal guardian served as the primary informant for all family history data; mothers were the primary informant (84.9%). The FHS has demonstrated acceptable validity and reliability. A dichotomous variable (yes/no) was computed from three questions as an indicator of whether or not the mother and father had significant psychopathology. A "YES" required a positive response to three questions asking if the parent: (1) ever had an emotional problem or mental illness; (2) had ever sought treatment with a psychiatrist, psychologist, social worker, doctor, or other health professional because of a mental health problem; and (3) had a history of one major diagnostic symptom or disorder. The symptoms and disorders queried about included depression and bipolar disorders, anxiety disorders, suicide attempt, alcohol abuse, problems with illegal drug use, or criminal behavior (arrest, conviction, or detention). For exploratory analyses, a yes/no variable was created for each parent regarding a history of any of the three latter problems, regardless of impairment or treatment history. Cronbach's alpha for FHS items Q1, Q2, and the binary variable defined by a "yes" to any of the specific problems (including parent criminality and drug/alcohol abuse) is 0.78 for fathers, and 0.73 for mothers (0.71 for mother and father items together).

Depressive Symptoms (Poznanski and Mokros 1996)—The Children's Depression Rating Scale-Revised (CDRS-R), a semi-structured interview, was conducted with adolescents to assess depressive symptoms over the previous 2 weeks. Items are rated on a either a 5- or 7-point scale with more severe symptoms given higher scores. For example: Sleep disturbance is rated on a 5-point scale ranging from (1) No difficulty or occasional difficulty that is situationally explainable, (3) Frequently has mild difficulty with sleep, to (5) Has difficulty with sleep nearly every night. Interviewers were trained for reliability by the PI and a research team member who had received specialized research diagnostic training. Inter-interviewer reliability for total severity scores, established prior to the study onset via a minimum of three concordant interviews, was high (mean α across raters = .98).

Suicidal Ideation (Reynolds 1988)—The 15-item self-report Suicidal Ideation Questionnaire—Jr. (SIQ-JR) assessed severity of adolescents' suicidal thoughts. It has demonstrated predictive validity for psychiatrically hospitalized adolescents (King et al. 1997), and internal consistency in this sample was high (.92). The SIQ-JR total score ranges from 0 to 90 at 1-point increments. Sample items include: "I thought it would be better if I was not alive" and "I thought about writing a will."

Hopelessness (Huth-Bocks et al. 2007)—The 20-item self-report Beck Hopelessness Scale (BHS) (Beck and Steer 1993) has been shown to be a predictor of suicide attempts in adolescents. Sample items include: "I can't imagine what my life would be like in 10 years"

and “There’s no use in really trying to get anything I want because I probably won’t get it.” Internal consistency in this sample was .91.

Alcohol and Substance Use Disorders (Winters 1992)—The 41-item Personal Experiences Screen Questionnaire (PESQ) has demonstrated high levels of sensitivity and specificity in identifying alcohol and substance use disorders. Sample items include: “How often have you used alcohol or other drugs at home” and “How often have you made excuses to teachers about your alcohol or drug use?” Internal consistency for the Problem Severity Scale was .94.

Internalizing and Externalizing Symptoms (Achenbach 1991)—The Youth Self-Report (YSR) is a widely used measure with strong psychometric properties. Sample items include: “I feel lonely,” “I cry a lot,” (Internalizing) and “I destroy my own things,” “I disobey my parents” (Externalizing). Internal consistency was high for the Internalizing ($\alpha = .89$) and Externalizing ($\alpha = .86$) problem scores used in this study.

Anxiety Symptoms (MASC; March 1997)—The Multidimensional Anxiety Scale for Children (MASC) (MASC; March 1997) is a 39-item self-report scale designed to assess a broad spectrum of anxiety symptoms. Sample items include: “I feel tense or uptight” and “I keep the light on at night.” Internal consistency coefficients in this sample for the seven subscales were: Tense ($\alpha = .82$), Somatic Symptoms ($\alpha = .79$), Anxious Coping ($\alpha = .68$), Perfectionism ($\alpha = .55$), Humiliation Fears ($\alpha = .91$), Performance Fears ($\alpha = .72$), Separation Anxiety ($\alpha = .76$). The MASC total score is the sum of these scores (ranging from 0 to 117 at 1-point increments). Internal consistency for the total score in this sample was .92.

Family and Social Support—Adolescents’ perceptions of social and family support were assessed with the Perceived Social Support from Family scale (PSS-Fa) (Procidano and Heller 1983). The PSS-Fa is a 20-item self-report scale with excellent internal consistency (.88) and concurrent validity (Cumsille and Epstein 1994). Sample items include: “My family gives me the moral support I need” and “There is a member of my family I could go to if I were just feeling down, without feeling funny about it later.”

Procedures—Baseline assessments occurred during or within 1 week of hospitalization. Participants were followed over the course of 1 year, with interim follow-up visits occurring at 6 weeks, 3 months, 6 months and 12 months beyond baseline.

Participants were interviewed by mental health professionals (masters level and above) who received an additional 30–40 h of training in research procedures, risk management, and reliability. Reliability was assessed using a team member, who had received specialized research diagnostic training, as a gold standard. Continued supervision was provided to prevent interviewer drift. All interviewers followed a risk management protocol which involved classifying participants by risk status, seeking immediate clinical consultation, and referring for emergency services if needed.

Statistical Methods

Survival analyses were used to construct multivariate models that predict time-to-suicide attempt over 1 year (Kalbfleisch and Prentice 2002). We considered a continuous measurement of time until first suicide attempt by assuming that attempts occurred at mid-month. In order to make use of the partial information available for those known to have made an attempt but missing the exact month, we imputed an attempt date equal to the mid-point of the time interval between the measurement occasion at which the indication of an event was provided and the last known attempt-free measurement occasion (21% of observed attempters). Those lost to follow-up prior to conclusion of the 1-year period were censored at the last non-missing measurement.

Differences in baseline characteristics were evaluated using the two-sample *t*-test for continuous variables and Fisher's exact test for categorical variables. The unadjusted cumulative incidence of suicide attempt over the course of follow-up was calculated from the Kaplan–Meier product-limit estimator, and the significance of the overall difference in stratified survival functions was assessed with the log-rank test. The median duration of follow-up was based on the Kaplan–Meier survival function with reverse censoring.

Multivariable-adjusted cumulative incidence estimates and hazard ratios were calculated using Cox proportional hazards regression analysis. Clinical variables measured over time were treated as time-varying covariates in the regression analysis with values imputed between the mid-points of available measurement occasions. Starting from a full model that included all hypothesized risk factors and potential confounders, we employed a backwards model selection procedure where the least significant predictor variables were removed one at a time until only statistically significant variables remained. Because of its importance as a hypothesized risk factor, multiple attempt history was retained in all models regardless of statistical significance. Because the King et al. (2009a) Youth-Nominated Support Team intervention was not found to have any trend or significant effect on the outcome of suicide attempts in a randomized controlled trial, the YST intervention was not included as a variable in analyses.

All *p*-values given are for two-sided hypothesis tests; values less than 0.05 were considered significant. Analyses were performed using SAS 9.2 (SAS Institute, Inc., Cary, NC).

Results

Baseline Characteristics

Adolescents—The baseline characteristics of participating adolescents are provided in Table 1, which includes means and standard deviations (SD) for all primary variables. The mean depression score of 60.7 on the CDRS-R is above the published clinical cut-point on this scale and is equivalent to a standardized *t*-score of 76 (99th percentile) (Poznanski and Mokros 1996). The mean suicidal ideation score of 45.4 on the SIQ-JR is also above the validated clinical cut-point of 31 (Reynolds 1988). In total, 268 of the 352 adolescents had made at least one previous suicide attempt prior to enrollment in the study (76.1%). Further, 39.5% of participants had histories of multiple suicide attempts. As measured at baseline,

82.2% had their biological mother present in their household and 45.1% had their biological fathers present.

Overall, 197 adolescents had at least one biological parent with a history of mental health problems (56.0%). Baseline functional impairment total scores on the CAFAS were marginally higher (trend) for adolescents who had a biological mother with a history of mental health problems (mean of 108.8 [SD = 33.1] vs. 101.8 [SD = 35.4], $p = .06$; these total scores were significantly higher for adolescents who had a biological father with a history of mental health problems (107.6 [34.0] vs. 97.3 [32.9] for fathers, $p = .01$). Other indices of psychopathology were not found to differ for adolescents with and without biological parents with histories of mental health problems. Mental health problems among fathers were associated with an increased prevalence of previous multiple attempts among their high-risk adolescents; however, an association in the opposite direction was observed for mothers (Table 1).

Parents—Parents with a history of mental health problems were more likely to acknowledge difficulty carrying out family responsibilities (43.4 vs. 4.8% for mothers, 55.0 vs. 5.5% for fathers, $p < .001$ for both) and also more likely to have made a past suicide attempt (38.5 vs. 3.2% for mothers, 36.3 vs. 3.1% for fathers, $p < .001$ for both). Sixty-one mothers and 40 fathers reported having made a suicide attempt in their lifetime. Race was not associated with parent mental health history (55.3% of Caucasian adolescents had an affected parent compared to 60.9% of non-Caucasians, $p = 0.53$). Overall, 22.3% of Caucasians and 34.8% of non-Caucasians had at least one biological parent with drug or alcohol problem and criminality ($p = 0.09$).

Neither the demographic characteristics of adolescents (age, gender, and race/ethnicity), nor the educational level of the parents varied by parental history of mental health problems. Adolescents with at least one affected parent were less likely to come from a household composed of both biological parents (30.4 vs. 42.2%, $p = .03$). Related to this, mothers and fathers with histories of mental health problems were less likely to live with the adolescent (79.6 vs. 87.8%, $p = .05$; 39.6 vs. 67.5%, $p < .001$) and affected fathers were less likely to be currently married (50.6 vs. 71.9% of unaffected fathers; $p = .003$).

Based on the FHS, 18.7% of biological mothers and 40.2% of biological fathers had a period in life when they drank too much, had a drinking problem, or others thought they had a drinking problem. For the use of illegal drugs and a “drug problem,” the comparable numbers are 20.1% of biological mothers and 36.2% of biological fathers. Furthermore, 8.3% of biological mothers and 29.6% of biological fathers had been in jail or had been arrested or convicted of a crime other than drunk driving. Parents with histories of alcohol/substance abuse and criminal behavior were less likely to live with the adolescent at baseline (47.1% of mothers and 14.9% of fathers with such histories lived with the adolescent compared to 88.1% of mothers and 63.8% of fathers without such histories, $p < .001$ for both).

Follow-Up

The overall median duration of follow-up was 12.1 months (95% CI: 12.0–12.2). Seventy-two percent of subjects were retained at 1-year follow-up and 79% of subjects were retained for one or more post-hospitalization assessments. A history of mental health problems among at least one biological parent was not related to loss to follow-up (duration of follow-up time was not statistically different when stratified by parental history, $p = .40$). Similarly, there was no difference in the proportion of adolescents with parental mental health problems between those who returned for at least one follow-up assessment and those who contributed only baseline data. The 42 participants who did not contribute follow-up beyond baseline, however, had significantly higher CAFAS total scores compared to those who returned for at least one follow-up: CAFAS total mean of 104.8 (SD = 34.5) and 117.6 (SD = 37.7) for those with and without follow-up, respectively ($p = .04$).

Suicide Attempts During Follow-Up: Univariate Predictions

Sixty-three adolescents made a suicide attempt during the 1-year of follow-up based on either adolescent or parent report. Maternal and paternal history of mental health problems, higher SIQ-JR, CAFAS, hopelessness (BHS), CDRS-R, and internalizing symptom (YSR Internalizing) scores were individually associated with increased risk of attempt during follow-up. The unadjusted hazard ratios are as follows: 2.21 for maternal history of mental health problems, 95% CI: 1.30–3.75, $p = .003$; 2.16 for paternal history of mental health problems, 95% CI: 1.16–4.03, $p = .02$; 1.30 for a 10-point increase in SIQ-JR, 95% CI: 1.14–1.48, $p < .001$; 1.26 for a 20-point increase in CA-FAS, 95% CI: 1.12–1.42, $p < .001$; 1.51 for a 5-point increase in BHS, 95% CI: 1.22–1.87, $p < .001$; 1.29 for a 10-point increase in CDRS-R, 95% CI: 1.10–1.52, $p = .002$; 1.18 for a 5-point increase in YSR Internalizing, 95% CI: 1.05–1.32, $p = .004$. Univariate analysis indicated that adolescents who had histories of multiple suicide attempts were not significantly more likely to make an attempt during follow-up (unadjusted HR = 1.59, 95% CI: 0.95–2.64, $p = .08$), although it trends in the direction of greater likelihood. Similarly, having made at least one previous suicide attempt was not associated with attempt during follow-up.

The demographic variables of age, sex, hospital site, and parental household composition (whether or not each parent, or both parents, live with the adolescent) were not significantly associated with suicide attempts during follow-up based on univariate analysis. Similarly, race alone was not a significant predictor of time-to-attempt (HR = 1.14 95% CI: 0.52–2.51, $p = 0.75$ for Caucasians relative to non-Caucasians). In terms of clinical variables, anxiety symptoms (on the MASC), alcohol and substance use disorder scores (PESQ), family and social support (PSS-Family), and YSR Externalizing scores were not associated with suicide attempts during follow-up. Finally, maternal and paternal history of a past suicide attempt, and alcohol/substance abuse and criminal behavior were not significant in separate univariate models.

Adolescents were about twice as likely to make a suicide attempt over the course of the year if they had at least one biological parent with a history of a mental health problem (the stratified Kaplan–Meier estimates of cumulative incidence over follow-up were significantly different for the two parental history groups, $p = .002$). The 1-year cumulative incidence of

suicide attempts was estimated to be 0.23 (95% CI: 0.17–0.30) for adolescents with at least one biological parent with a history of mental health problems, and 0.10 (95% CI: 0.06–0.16) for adolescents without such an affected parent (Table 2). While the cumulative incidence of suicide attempt was higher for those adolescents that entered the study having made multiple previous attempts (trend), there was a consistent increase in the cumulative incidence of attempts observed during the study among those with a parent with a mental health problem, regardless of previous attempt history (Fig. 1).

Suicide Attempts During Follow-Up: Multivariate Predictions

In a multivariable regression model that included having at least one parent with a history of mental health problems as a binary indicator variable and that adjusted for multiple attempt history, SIQ-JR, and CAFAS, the parental history effect on time-to-attempt remained significant (HR = 2.22, 95% CI: 1.23–4.00, $p = .008$).

In a subsequent multivariable model that treated parental history of mental problems as a four-factor categorical variable (both mother and father, mother but not father, father but not mother, neither), and that adjusted for multiple attempt history, SIQ-JR, CAFAS, and the parental history effect were significant when both mother and father were affected and when only the mother was affected (Table 3). Whether the parental history was binary or a four-category variable, no interactions between functional variables and parental history were significant. Additionally, no interactions between these variables and multiple attempt history were significant.

Discussion

This short-term longitudinal study used survival analyses to examine predictors of time-to-suicide attempt for adolescents who were acutely suicidal and psychiatrically hospitalized at the beginning of the study. Our primary results point to the substantial impact of parental mental health problems on these adolescents' course and outcome, or developmental trajectories, following psychiatric hospitalization. They indicate that adolescents were about twice as likely to make a suicide attempt over the course of the year if they had at least one biological parent with a history of a mental health problem. In fact, the 1-year cumulative incidence of suicide attempts was approximately 23% for adolescents with at least one biological parent with a history of mental health problems and 10% for other adolescents. Perhaps the most striking finding is that adjustment for multiple attempt history, severity of suicidal ideation, and functional impairment—three clinically significant variables—had little impact on the estimated effect of parental history of mental health problems.

It is also notable that we identified only additive effects on time-to-suicide attempt post-hospitalization. In contrast to the findings reported by Goldston et al. (1999), who found that some indices of adolescent functioning had differential predictive utility as a function of history of suicide attempt, we found no interactions between individual level variables. Specifically, we found no interactions between history of suicide attempt, depression severity, anxiety, alcohol/drug abuse, and hopelessness, in the prediction of suicide attempt. We also found no interactions between history of suicide attempt and parental history of mental health problems, or between indices of adolescent functioning and parental history of

mental health problems. Rather, parental history of mental health problems, adolescent functional impairment, and adolescent suicidal thoughts were each predictors in our model. It is possible that this difference in findings is partially due to our use of time-varying covariates for variables of adolescent functioning rather than the baseline covariates used in the Goldston et al. study. It may also be due to the differences in the follow-up interval as the Goldston et al. study incorporated a 5-year interval. Further, it should also be noted that the inability to detect interactions is not at all an indication that they do not exist, just that our study does not provide sufficient evidence to make any definitive conclusions about them. Our findings suggest that all identified risk factors are individually important and should be assessed and targeted for intervention as a strategy for preventing future suicide attempts.

Some study findings were unexpected. A history of at least one previous attempt was not associated with suicide attempt during follow-up and a history of multiple suicide attempts had only a trend association with attempt during follow-up. Although previous studies have found clear associations between suicide attempts, particularly multiple suicide attempts, and subsequent suicide attempts (Gould et al. 1998), the absence of an association in this study may reflect the high level of elevated risk for suicidal behavior among participants. These adolescents were admitted to the hospital due to acute suicide risk and many of the “non-attempters” had clear plans for suicide attempts. This is consistent with the finding of King et al. (1995) who observed the highest rate of suicidal behavior following psychiatric hospitalization (38.5%) among adolescents who were hospitalized because of active and serious suicidal intent rather than for suicidal behavior. A second surprising finding was that a positive history of maternal mental health problems was associated with lower rates of multiple attempts among adolescents at baseline. The association between maternal mental health problems and adolescent multiple attempts was, however, in the expected direction in longitudinal analyses. Further, paternal mental health problems were associated with higher rates of multiple attempts in both cross-sectional and longitudinal analyses. We do not have an explanation for the discrepant maternal findings.

Types of Parental Mental Health Problems: Parent Problem Behavior

Study findings also suggest that adolescents may be differentially impacted by whether or not the parent has problems with alcohol or drug abuse and criminality. It is likely that the measure of parental mental health history used in this study provided a stronger assessment of parental emotional and mental disorders than of parent problem behavior such as alcohol/substance abuse and criminal behavior. Nevertheless, in secondary analyses, we examined univariate associations between both parental alcohol/drug abuse and criminality (separately for mothers and fathers) and adolescent time-to-attempt. Whereas parental mental health history was a significant predictor (whether or not alcohol/drug abuse and criminality problems were included in its calculation), parental alcohol/drug abuse and criminality was not. A potential explanation for this finding is that parental mental health problems such as depression and anxiety may be ongoing in middle age, and may continue to impact parent and family functioning. In contrast, given normative desistance trends in alcohol/drug abuse, and criminal behavior (Bachman et al. 2002; Sampson and Laub 1990), these problems may have occurred primarily during parents’ adolescence and young adulthood. While such problems may have conferred a genetic vulnerability for adolescent psychopathology and

suicidal behavior, they may not have ongoing impacts on daily living and family functioning. It is also possible that participants had less exposure to parents with histories of substance abuse or criminality, given findings suggesting that parents with such histories were less likely to live with their children.

Study Strengths and Limitations

This study has a number of significant strengths, including its longitudinal design, the large clinical sample recruited from two sites (university and private psychiatric hospitals), and the use of survival analyses that made use of time-varying covariates to take into account changes in the magnitude and direction of predictor variables over time. The examination of parental mental health histories and, specifically, the mental health histories of mothers and fathers is also a unique strength of this study; to our knowledge, this has not been investigated previously in a large clinical sample of suicidal adolescents. Brent et al. (1993) examined family history of psychiatric condition (suicidal behavior, substance abuse, affective disorder) as a predictor of suicide attempts. However, they had a much smaller sample size (13 adolescents had made a suicide attempt prior to follow-up) and examined only univariate associations.

Study limitations include sample characteristics that may limit the generalizability of findings. The study sample was primarily Caucasian and recruited from one region of the U.S. Furthermore, all subjects in the present study were psychiatrically hospitalized and recruited into a large randomized controlled intervention trial. As such, the recruitment rate, although comparable to that for intervention trials of non-primary treatments, was lower than would be ideal and likely reflects the acuity of the inpatient setting and consequent adolescent and family distress, the lengthy informed consent process, and the fact that families were asked to consent prior to randomization to study condition. Our measure of parents' histories of mental health problems is not ideal for several reasons. First, it was completed by only one informant, which was usually a mother. A second informant or other validation strategy was not used. Diagnostic criteria and timing of parental mental health problems were not assessed. Consequently, it is unclear when and for what length of time parental psychopathology was present during the youth's development. It is possible the parent's difficulties were resolved prior to the child's birth. Finally, we did not correct p -values for multiple comparisons as only a limited number of exploratory analyses are presented; however, raw p -values are provided to enable readers to interpret them conservatively.

Clinical Implications and Future Directions

Our findings highlight the importance of fully assessing an adolescent's family environment prior to making treatment and post-hospitalization recommendations. These data indicate that parental mental health history is a critical risk factor that doubles the likelihood of an adolescent suicide attempt in the year following hospitalization. As a result, assessment of the adolescent's living situation (e.g., who resides in the home) and the mental health and treatment history of custodial and biological parents should be a regular part of a comprehensive risk assessment and treatment formulation.

Future research should continue to explore these findings in order to further inform treatment and prevention efforts. For example, more information is needed about the process by which parental mental health problems convey risk for suicide attempt. Previous work by our research group (King et al. 1997) suggests that one important mechanism may be the difficulty that mentally ill parents have in successfully linking their children to aftercare treatment as well as encouraging them to follow through with recommendations. Parental mental health history may impact outcomes for suicidal adolescents by impacting treatment adherence. It was notable that close to half of mothers and fathers who reported a history of mental health problems indicated that they had difficulty carrying out family responsibilities. It is possible that such difficulties would extend to the significant organizational burden of complying with treatment recommendations for a formerly hospitalized youth (e.g., medication compliance, medication management appointments, and weekly individual and/or family therapy sessions). Alternatively, it is possible that parents who have personally benefited from mental health treatment may be more likely to encourage their child's adherence to outpatient treatment. Therefore, parental use of mental health services and satisfaction with those services may be an important moderator variable.

Future research studies should continue to explore the nuances of parental mental health history in relation to adolescent suicide outcomes. Important questions that were beyond the scope of this study include specific risks associated with different types of parental mental health problems (depression/anxiety vs. substance abuse/conduct problems) as well as the timing of the parents' illness (i.e., during the child's lifetime vs. before the child was born, illness during critical periods of child development such as infancy and adolescence, and proximity of parental illness to the child's suicidal crisis). Additional research aimed at exploring these questions is needed to further define the effects of parental mental health history on adolescent suicide outcomes.

Conclusions

This longitudinal study made use of survival analyses to examine predictors of time-to-suicide attempt for a high risk group of adolescents who were psychiatrically hospitalized and suicidal at the beginning of the study. We found that these adolescents were about twice as likely to make a suicide attempt over the course of the 1-year post-hospitalization period if they had at least one biological parent with a history of a mental health problem. Further, although the cumulative incidence of suicide attempt was higher for adolescents who had previously made multiple previous attempts, and suicidal ideation and functional impairment were also significant predictors of suicide attempts, adjustment for these variables in a multivariate model had little impact on the predictive power of parental mental health problems. Risk factors were more additive in their impact and consistent with a family systems model, highlighting the importance of assessing and targeting adolescent and parental contributors to risk in treatments with high risk youth. These findings also point to the possible importance of these risk factors as targets for preventive interventions. Future interventions and treatment models need to incorporate a greater emphasis on parental contributors in order to more effectively reduce suicide risk among adolescents.

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Biographies

Cheryl A. King is a Clinical Psychologist, Professor of Psychology in the Departments of Psychiatry and Psychology, and Director, Institute for Human Adjustment at the University of Michigan. She received her Ph.D. from Indiana University and has research interests in youth/young adult suicide prevention and the development of effective psychosocial interventions.

David C. R. Kerr, Ph.D. is a Clinical Psychologist and Assistant Professor of Psychology in the Department of Psychology at Oregon State University. He received his Ph.D. from the University of Michigan and has research interests in the areas of developmental psychopathology, youth internalizing and externalizing disorders, and predictors of high risk behaviors, including suicidal behavior.

Michael N. Passarelli, M.S., M.P.H. is a doctoral student in the Department of Epidemiology at the University of Washington. He was a data analyst for the Youth Depression and Suicide Prevention Program at the University of Michigan prior to returning to graduate school. Research interests include methods of statistical analysis in the study of epidemiology.

Cynthia Ewell Foster, Ph.D. is a Clinical Psychologist and Assistant Professor in the Department of Psychiatry at the University of Michigan. She received her Ph.D. from Loyola University Chicago and has research interests in parent–child interactions and maternal depression as well as youth depression and suicide prevention.

Christopher R. Merchant, M.S. is a doctoral student in the Department of Psychology at the University of Michigan. His major research interests are suicide risk assessment and suicide prevention among African American adolescents, with a focus on understanding the social and interpersonal aspects of suicide risk.

Fig. 1.
Estimated cumulative incidence of suicide attempt by multiple attempt history and history of mental problems among at least one biological parent based on proportional hazards regression

Table 1

Baseline characteristics of acutely suicidal adolescents

Baseline characteristic of adolescents	Overall (<i>n</i> = 352)	Biological mother		Biological father		<i>p</i> ^a
		History of mental health problem		History of mental health problem		
		No (<i>n</i> = 190)	Yes (<i>n</i> = 149)	No (<i>n</i> = 167)	Yes (<i>n</i> = 98)	
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	
Multiple attempt history (%)	39.5	43.7	32.9	34.1	46.9	.05
Hopelessness	8.7 (5.8)	8.6 (5.8)	8.9 (5.9)	8.5 (5.9)	9.6 (5.7)	.14
Functional impairment	104.8 (34.5)	101.8 (35.0)	108.8 (33.1)	97.3 (32.9)	107.6 (34.0)	.02
Depressive symptoms	60.7 (12.9)	60.2 (12.8)	61.2 (12.7)	60.6 (12.7)	60.8 (13.7)	.92
Anxiety symptoms	46.4 (18.7)	45.9 (18.4)	47.7 (18.2)	46.2 (18.7)	47.8 (18.4)	.48
Family and social support	9.1 (5.5)	9.5 (5.6)	9.1 (5.4)	9.1 (5.4)	9.3 (5.7)	.82
Suicidal ideation	46.7 (20.6)	45.4 (19.7)	47.6 (21.5)	45.1 (21.1)	49.8 (20.0)	.07
Externalizing symptoms ^b	50.0 (10.0)	49.3 (9.6)	50.6 (10.4)	49.2 (9.8)	50.5 (10.1)	.32
Internalizing symptoms ^b	50.0 (10.0)	49.7 (9.7)	50.4 (10.1)	49.4 (9.7)	51.1 (9.8)	.18

Note: Values shown are mean (SD) for continuous variables and % with characteristic for categorical variables. For some variables *n* may be less due to missing data

Hopelessness = Beck Hopelessness Scale; Functional impairment = Child and Adolescent Functional Assessment Scale; Depressive symptoms = Children's Depression Rating Scale—Revised; Anxiety symptoms = Multidimensional Anxiety Scale for Children; Family and social support = Perceived Social Support from Family; Suicidal ideation = Suicidal Ideation Questionnaire-Junior; Externalizing and internalizing symptoms = Youth Self-Report

^aTwo-sample *t*-test assuming unequal variances for continuous variables (two-sided) and Fisher's exact test for categorical variables (two-sided)

^bScores presented for YSR subscales are standardized *t*-scores for the overall sample

Table 2

Cumulative incidence of suicide attempt by parent history of mental health problem

Description	At least one biological parent with mental health problem				<i>p</i> ^a
	No		Yes		
	Statistic	95% CI	Statistic	95% CI	
Baseline					
Number at risk of attempt	155	–	197	–	
6 Months					
Number remaining at risk of attempt	139	–	167	–	
Cumulative number of attempters	11	–	25	–	
Unadjusted cumulative incidence	0.07	(0.04, 0.13)	0.13	(0.09, 0.18)	
non-LMA cumulative incidence	0.05	(0.02, 0.08)	0.11	(0.06, 0.16)	
LMA cumulative incidence	0.07	(0.03, 0.12)	0.17	(0.10, 0.24)	
12 Months					
Number remaining at risk of attempt	86	–	95	–	
Cumulative number of attempters	15	–	44	–	
Unadjusted cumulative incidence	0.10	(0.06, 0.16)	0.23	(0.17, 0.30)	
non-LMA cumulative incidence	0.08	(0.04, 0.13)	0.19	(0.12, 0.26)	
LMA cumulative incidence	0.13	(0.05, 0.19)	0.28	(0.18, 0.37)	
Overall					
Unadjusted HR	Ref.	–	2.45	(1.37, 4.41)	.003
LMA-adjusted HR	Ref.	–	2.42	(1.34, 4.34)	.003
Multivariable-adjusted HR ^b	Ref.	–	2.22	(1.23, 4.00)	.008

Note: Unadjusted cumulative incidence from Kaplan–Meier survival function, adjusted cumulative incidence from proportional hazards regression

HR hazard ratio with no parent history as the reference group (Ref.), CI confidence interval, LMA lifetime multiple attempter, SIQ-JR Suicidal Ideation Questionnaire-Junior, CAFAS child and adolescent functional assessment scale

^a *p*-values for hazard ratios are from proportional hazards regression (two-sided)

^b HR adjusted for LMA, SIQ-JR, and CAFAS

Table 3

Proportional hazards regression results for time-to-attempt

Variables	Suicide attempt among adolescents		
	HR ^a	95% CI	p ^b
Parent history of mental health problems			.04
Both mother and father	2.63	(1.25, 5.50)	.01
Mother but not father	2.36	(1.22, 4.58)	.01
Father but not mother	1.59	(0.67, 3.77)	.29
Neither	Ref.		
LMA			.10
Yes	1.55	(0.91, 2.63)	
No	Ref.		
Suicidal ideation	1.23	(1.08, 1.40)	.003
Functional impairment	1.21	(1.07, 1.37)	.003

HR = Hazard ratio, CI = Confidence interval, LMA = Lifetime multiple attempter, Suicidal ideation = Suicidal Ideation Questionnaire-Junior, Functional impairment = Child and Adolescent Functional Assessment Scale

^aNeither is the reference group for parent history of mental health problems, No is the reference group for LMA, HR for SIQ-JR is for a 10-point increase and HR for CAFAS is for a 20-point increase

^bp-values for hazard ratios are from proportional hazards regression (two-sided), p-value for test of overall model <.001