

Prediction of Suicidal Behavior Risk among Adolescents Seen in Psychiatric Settings

by

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## **DEDICATION**

Dla kochanych Kubi i Juleczki-Kuleczki – za Waszą miłość, wsparcie i cierpliwość w tej naszej przygodzie.

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## **ABSTRACT**

Identifying adolescents at elevated risk for suicidal behavior, with the goal of preventing suicidal deaths and the morbidity associated with suicide attempts, is a national priority. However, there are important gaps in the literature concerning which adolescents are most vulnerable to suicidal behavior and how to best identify them. The overarching goal of this dissertation is to improve suicide risk prediction among high-risk adolescents who are most vulnerable to suicidal behavior and repeated suicidal crises and for whom accurate identification of risk is especially critical: psychiatrically hospitalized suicidal adolescents and youth seeking psychiatric emergency services. This dissertation project incorporated three studies examining: (1) the predictive validity and utility of an assessment approach incorporating youths' own assessment of their suicide risk in combination with a clinician-administrated instrument for youth evaluated in a psychiatric emergency department; (2) the impact of post-hospitalization course of suicidal ideation on subsequent suicidal crises, including suicide attempts and psychiatric rehospitalizations, and to identify the baseline predictors of a higher risk course after hospitalization; and (3) a promising theory of suicidal behavior, the Interpersonal-Psychological Theory of Suicidal Behavior, which hypothesizes a proximal pathway to suicidal behavior based on three constructs (low belonging, high perceived burdensomeness, acquired capability for suicide), to determine how well it predicts post-hospitalization suicide attempts within a sample of adolescents who were psychiatrically hospitalized for suicide risk. The results of these studies point to key indicators of risk associated with future suicide attempts and suicide-related crises: low confidence in ability to keep oneself from attempting suicide, persisting suicidal ideation,

sense of being a burden on others (for adolescent males and when accompanied by acquired capability for suicide), and sense of thwarted belongingness (particularly for adolescent females and when combined with low acquired capability). The results also point to notable heterogeneity among these youths, synergistic effects of risk factors, and time-varying effects of predictors on suicidal behavior and suicide-risk related crises.

## **CHAPTER I: Introduction**

### **Scope of the Problem**

Suicide is the third leading cause of death among adolescents in the United States (Centers for Disease Control and Prevention [CDC], 2012). Given its public health significance, and need for prevention, precursors to suicide are also of substantial importance. Within the last year, approximately 17% and 8% of high school students surveyed nationally reported serious suicidal thoughts and suicide attempts, respectively (CDC, 2014). Moreover, 2.7% of the surveyed students had made a suicide attempt that required medical attention (CDC, 2014).

The transition to adolescence marks a sensitive developmental period during which suicidal ideation and behaviors are on the rise. According to a recent, nationally representative study, the prevalence of suicidal ideation increases rapidly between ages 12 and 17 while the rates of plans and attempts are rising increasingly between the ages of 12 and 15 and then more slowly until age 17 (Nock et al., 2013). This increase is attributed in part to important developmentally normative events (e.g., greater cognitive ability of thinking about and planning a suicide), limitations in self-self-regulation of emotions and capacity for problems solving, as well as greater prevalence of psychopathology, particularly mood disorders and substance abuse (see review by Bridge, Goldstein, & Brent, 2006; King, 1997). There are also important suicide risk differences based on sex: while adolescent girls have higher odds of lifetime suicide ideation (by approximately 70%) and are nearly three times as likely to make suicide attempts (Nock et al., 2013), suicide is over three times more common among boys (CDC, 2012).

The importance of reducing mortality and morbidity associated with suicidal behavior is

indisputable. Severe suicidal ideation and suicide attempts are associated with psychiatric hospitalizations, distress for the youth and their families, and persisting psychosocial impairment that may extend into young adulthood (Fergusson, Horwood, Ridder, & Beautrais, 2005; Reinherz, Tanner, Berger, Beardslee, & Fitzmaurice, 2006; Yen, Weinstock, Andover, Sheets, Selby, & Spirito, 2013). On the national level, reducing suicide has been emphasized as an important public health priority by the Surgeon's General Call to Action to Prevent Suicide (U.S. Public Health Service, 1999) and by the Action Alliance for Suicide Prevention in the recently updated "National Strategy for Suicide Prevention: Goals and Objectives for Action" (U.S. Department of Health and Human Services [USDHHS], 2012). One of the goals (Goal 9) outlined by the Action Alliance is the need to promote and implement effective practices for assessing and treating individuals at risk for suicidal behaviors. A proper suicide risk assessment at the time of a suicidal crisis can inform an appropriate treatment plan, including need for psychiatric hospitalization. In addition, an accurate suicide risk determination is essential when planning for discharge and aftercare of suicidal individuals receiving psychiatric inpatient care, along with ongoing suicide risk assessment after the suicidal crisis.

It is particularly important to improve suicide risk detection approaches in high-risk populations that are most vulnerable to frequent suicidal crises. These high-risk subgroups include psychiatrically hospitalized youths and those seeking psychiatric services in Emergency Departments (EDs). Psychiatrically hospitalized teens are at high risk for repeated suicide attempts, especially within the first year of hospitalization (Goldston, Daniel, Reboussin, Reboussin, Frazier, & Kelley, 1999). The post-hospitalization rates of suicide attempts in this group range from 10% at three months to up to 18% within the first year after index hospitalization (Goldston et al., 1999; King, Kerr, Passarelli, Foster, & Merchant, 2010; King,

Segal, Kaminski, Naylor, Ghaziuddin, & Radpour, 1995; Spirito et al., 1992). EDs serve a high percentage of acutely suicidal adolescents, including teens presenting with suicide attempts at the time of ED evaluation (Ting, Sullivan, Boudreaux, Miller, & Camargo, 2012). The study of these high-risk adolescent populations is essential in aiding suicide prevention efforts.

More specifically, there are important gaps in the literature concerning which adolescents are most vulnerable to suicidal behavior, including continued suicidal episodes after crisis intervention (e.g., psychiatric hospitalization or psychiatric emergency services), and how to best identify these youth. In particular, the majority of psychiatrically hospitalized youths and youths seeking psychiatric services in EDs have numerous risk factors associated with suicidal behavior. It is particularly important to understand what propels some of the youths in these high-risk groups toward suicidal actions, but not others. *The overarching goal of this dissertation project is to improve the accuracy of suicide risk prediction among high-risk adolescents who are most vulnerable to suicidal behavior and repeated suicidal crises and for whom accurate identification of risk is especially critical.*

### **Definitions**

Different terms have been used in the literature to describe the same suicidal phenomena. To improve clarity in communication, several classification schemes have been proposed (Crosby, Ortega, Melanson, 2011; O'Carroll, Berman, Maris, Moscicki, Tanney, & Silverman, 1996; Silverman, Berman, Sanddal, O'Carroll, & Joiner, 2007). Based on recommendations from the Centers of Disease Control and Prevention (CDC; Crosby et al., 2011), the following terminology will be used in this dissertation project: **Suicidal ideation** involves thinking about, considering, or planning for suicide. A **suicide attempt** is a non-fatal self-directed potentially injurious behavior with any intent to die as a result of the behavior, which may or may not result

in injury. A **suicide** refers to death caused by self-directed injurious behavior with any intent to die as a result of the behavior. The CDC also proposes the term **non-suicidal self-directed violence** to describe behavior that is self-directed and deliberately results in injury to oneself where there is no evidence, whether implicit or explicit, of suicidal intent. Because many publications also refer to this behavior as **non-suicidal self-injury**, these two terms will be used interchangeably. In addition, for brevity, the umbrella term **suicide-related behavior** (from O'Carroll et al., 1996; Silverman et al., 2007) will be used to describe non-suicidal self-injury, suicide attempts, and suicide.

It is also important to clarify who are adolescents. **Adolescence** has been defined as the period between childhood and adulthood, during which there are important developmental changes in the domains of physical (e.g., puberty), cognitive (e.g., abstract thought; expanding intellectual interests; greater capacity for goal setting), and social-emotional (e.g. sense of identity; increased influence of peers; striving for independence) development (USDHHS, 2013). There is no established age range that defines adolescence. The World Health Organization uses the age range of 10 to 19 years while the American Academy of Pediatrics (Hagan, Shaw, & Duncan, 2008) uses the age range of 11 to 21. Publications on adolescent development by the American Psychological Association (APA; 2002), on the other hand, define adolescents as youth between the ages of 10 and 18. Many researchers in the U.S. also use the age of 10-24 years; this is further divided into early (approximately 11-13 years), middle (approximately 14-18 years), and late (approximately 19-24) adolescence (USDHHS, 2013). While there is no standard definition based on age, there is generally agreement that adolescence begins with the onset of puberty and ends with meeting the developmental goals of this period. Because some aspects of adolescent development may extend beyond age 18 or 19 (APA, 2002), this may

account for why some researchers include a higher age limit of 21 or even 24 when defining adolescence. In this dissertation project, two studies include an age range of 13 to 17 years, and one study includes an age range of 13 to 24 years.

In addition, **clinical utility** is a multidimensional concept used in many different fields, broadly referring to the usefulness or benefit of an intervention, outcome, product, or process (Lesko, Zineh, & Huang, 2010). Applied to suicide risk assessment, clinical utility can be defined as usefulness of an instrument or protocol in identifying who will engage in suicidal behavior. The clinical utility of an assessment instrument can be more specifically conceptualized as sensitivity (or correctly identifying individuals who attempt suicide) and specificity (or correctly identifying individuals who do not attempt suicide). In general, suicide risk instruments have higher sensitivity, which is prioritized to capture the greatest number of at-risk individuals, than specificity. Previous studies of these instruments have reported acceptable sensitivity and specificity, respectively, as 80% and 57% (Huth-Brocks et al., 2007) and as high as 71% and 73% (Goldston et al., 2001). A measure that can predict suicidal behavior with greater sensitivity and specificity would, for the purposes of this dissertation, be considered as having good clinical utility. The conceptualization of clinical utility could also be broadened to include a focus on a measure's or a protocol's ability to improve suicide risk formulation and decision-making, such as by adding novel information that can improve suicide risk prediction. In other words, clinical utility of a measure also refers to the "meaningfulness of improvement" over existing measures or assessment practices that improve clinical decision making (Hunsley, 2003).

### **Risk and Protective Factors for Suicide and Suicide Attempts**

While an extensive review of risk and protective factors is beyond the scope of this dissertation, we focus on factors that are most pertinent to this project. A comprehensive review of risk and protective factors is provided by Bridge et al. (2006), Moscicki (1997), and Spirito and Esposito-Smythers (2006).

#### Suicidal Ideation:

Severe and pervasive suicidal ideation has been associated with subsequent suicide attempts in community studies of adolescents (Lewinsohn, Rohde, & Seeley, 1994). Similarly, among psychiatrically hospitalized suicidal adolescents, severe suicidal ideation at the time of hospitalization predicted suicide attempts six months to a year later (King et al., 1995, 2010). However, in a sample of adolescent psychiatric inpatients followed for 5 years, suicidal ideation at the time of hospitalization was not associated with a higher risk of attempting suicide, suggesting that suicidal ideation alone may not be a sufficient risk factor for certain high-risk groups (Goldston et al., 1999). Moreover, longitudinal studies involving community and psychiatric adolescent samples have found that the association between suicidal ideation and suicide attempts is moderated by sex, where severe suicidal ideation was predictive of future suicide attempts for adolescent girls but not boys (Lewinsohn, Rohde, Seeley, & Baldwin, 2001; King, Jiang, Czyz, & Kerr, 2014).

#### Previous suicidal behavior:

A history of a suicide attempt constitutes the strongest predictor of future suicide attempts in both community and clinical samples of adolescents (Goldston et al., 1999; Lewinsohn, et al., 1994; Nrugham, Larsson, & Sund, 2008) and death by suicide (Brent, Baugher, Bridge, Chen, & Chiappetta, 1999; Groholt, Ekeberg, Wichstrom, & Haldorsen, 1997; Shaffer et al. 1996). A prior suicide attempt is associated with a higher risk of suicide for boys



(30-fold) than girls (3-fold) (Shaffer et al., 1996). Adolescents who attempt suicide more than once are at an especially elevated risk for making a subsequent suicide attempt in the future. In a five-year follow-up study of psychiatrically hospitalized adolescents, the number of prior attempts was the strongest predictor of subsequent attempts, and multiple suicide attempters were at twice the risk of making a subsequent attempt compared to single attempters and suicide ideators combined (Goldston et al., 1999). In a longitudinal study of suicide attempters who received hospital emergency treatment, multiple attempters had more than three times higher odds of making another suicide attempt within a year compared to first-time attempters (Hulten et al., 2001). Moreover, high school students identified as multiple attempters at baseline had approximately four times higher odds of making another suicide attempt at a follow-up four to six years later compared to single attempters and suicide ideators (Miranda, Scott, Hicks, Wilcox, Harris Munfakh, & Shaffer, 2008). Multiple attempters report thoughts and behaviors indicative of higher intent to die compared to other suicidal groups—such as more often regretting recovery from the attempt, planning their attempt so that intervention was less likely, and more often reporting wishing to die at the time of their last attempt (Miranda et al., 2008)—and are thus especially vulnerable to suicidal behavior.

Non-suicidal self-injury (NSSI):

NSSI is an important correlate of suicidal behavior and, although differentiated from suicidal behavior by absence of intention to die and lethality of behavior, these two types of self-injurious behaviors frequently co-occur (review by Hamza, Stewart, & Willoughby, 2012). Retrospective and prospective studies of treatment-seeking and community samples of adolescents have demonstrated that NSSI is a strong risk factor for suicidal ideation and suicidal behavior (Asarnow et al., 2011; Hamza et al., 2012; Klonsky, & Glenn 2013; Wilkinson, Kelvin,

Roberts, Dubicka, & Goodyer, 2011); the association between NSSI and suicidal behavior is maintained even when accounting for important demographic and clinical risk factors. Certain characteristics of NSSI, such as longer history of engaging in this behavior, use of greater number of methods, and absence of physical pain during NSSI, may confer greater risk for suicide attempts (Nock, Joiner, Gordon, Lloyd-Richardson, & Prinstein, 2006). Several theories have been proposed to account for the relationship between NSSI and suicidal behavior (review by Hamza et al., 2012): (1) the “gateway theory,” in which NSSI may serve as a gateway or lead to more extreme forms of self-injury, including suicidal behavior, (2) the “third variable theory,” in which another variable explains this relationship (e.g. psychological distress, borderline personality disorder), and (3) “acquired capability for suicide,” a subcomponent of the Interpersonal-Psychological Theory of Suicidal Behavior, proposing that NSSI reduces inhibition toward suicidal behavior through a process of habituation toward self-injury.

#### Psychiatric Disorders:

The presence of mental health disorders is very common among adolescents who engage in suicidal behavior. It is estimated that between 80 and 90% of adolescents who die by suicide have had a psychiatric disorder such as mood, anxiety, conduct, and substance abuse disorders (Brent et al., 1999; Gould, Greenberg, Velting, & Shaffer, 2003; Shaffer et al., 1996). Mental health disorders also increase the risk of suicide attempts (Andrews & Lewinsohn, 1992; Brent et al., 1993a; Borowsky, Ireland, & Resnick, 2001; Gould et al., 1998), with some recent estimates demonstrating that approximately 96% of adolescents who had ever attempted suicide met criteria for at least one psychiatric disorder (Nock et al., 2013). Comorbidity, or the presence of two or more psychiatric disorders, is associated with an especially high suicide risk in both community and clinical adolescent samples (Lewinsohn, Rohde, & Seeley, 1996; Goldston et al.,

2009). Depression is among the leading predictors of suicide and suicide attempts among adolescents (Brent et al., 1993b; Schafer et al., 1996; Nock et al., 2013). Substance abuse, particularly alcohol, is also associated with increased risk for suicidal behavior and suicide (Andrews & Lewinsohn, 1992; Borowsky et al., 2001; Gould et al., 1998; Moscicki, 1997), especially when more than one substance is used. In fact, the risk of suicide attempts among adolescents doubles with each additional substance used (Kokkevi, Richardson, Olszewski, Matias, Monshouwer, & Bjarnason, 2012). Substance use disorders in combination with a mood disorder confer an especially high risk for suicidal behavior (e.g., Brent et al., 1993; Shafii, Steltz-Lenarsky, Derrick, Beckner, & Whittinghill, 1988). Conduct disorders and disruptive behaviors are also among disorders that are strongly associated with youth suicides and suicide attempts (Andrews & Lewinsohn, 1992; Groholt, Ekeberg, Wichstrom, & Haldorsen, T, 1998; Schafer et al., 1996). It is noteworthy that while some studies (e.g., Gould et al., 1998) have not found an association between disruptive disorders and suicide attempts, they nevertheless reported that symptoms of aggressiveness were predictive of suicide risk even after controlling for psychiatric disorder.

#### Hopelessness:

Hopelessness is usually defined as negative expectations about the future. There is a well-documented relationship between hopelessness and suicidal ideation and behavior among adults (e.g., Beck & Steer, 1998; Beck, Steer, Beck, & Newman, 1993; Beck, Steer, Kovacs, & Garrison, 1985). Among adolescents, on the other hand, the strength of this relationship has received more mixed results. For example, studies of clinical and community adolescent samples have found that hopelessness was no longer, or only moderately, related to suicidal ideation and previous suicide attempts when controlling for other variables such as depression (Cole, 1989;

Lewinsohn, Rohde, & Seeley, 1993; Pinto & Whisman, 1996). Others have found that hopelessness was associated with suicidal ideation in a community (Rich, Kirkpatrick-Smith, Bonner, & Jans, 1992) and inpatient (Hewitt, Newton, Flett, & Callander 1997; Steer, Kumar, & Beck, 1993) samples of adolescents, even when accounting for factors such as depression, substance use, reasons for living, and perfectionism. In addition, in a sample of high school students, change in hopelessness within a period of one year was a significant predictor of change in suicidal ideation for girls, and was at a trend level for boys, even when depression and other key variables (daily hassles, negative life events, social support) were controlled for (Mazza & Reynolds, 1998). Hopelessness also predicted suicide attempts among psychiatrically hospitalized adolescents followed for up to seven years, but only for those with a history of suicide attempts (Goldston et al, 2001).

#### Social and Interpersonal Factors:

Social and interpersonal factors are also salient determinants of adolescent suicidal behavior (review by King and Merchant, 2008). In particular, we focus on social connectedness and history of abuse.

*Social Connectedness:* Social connectedness has been broadly conceptualized as including aspects such as sense of closeness to an individual or group, perceived caring and support, sense of belonging, satisfaction with relationships, and comfort with talking about problems to important others (e.g., Barber and Schluterman, 2008; Blum, Halcon, Beuhring, Pate, Campell-Forrester, & Venema, 2003; Borowsky et al., 2001; Resnick et al., 1997). Adolescents' perception of connectedness to others is a protective factor associated with a reduction in suicidal ideation, suicide attempts, and multiple health risk behaviors linked to youth suicide risk (i.e. depressive symptoms, substance use, violence involvement, delinquency)

(Ackard, Neumark-Sztainer, Story, & Perry, 2006; Borowsky et al., 2001; Neumark-Sztainer, Story, French, & Resnick, 1997; Resnick et al., 1997). The most studied form of connectedness and suicide-related outcomes is that pertaining to the family (e.g., Borowsky et al., 2001; Kidd, Henrich, Brookmeyer, Davidson, King, & Shahar, 2006). While less is known about the impact of peer connectedness on youth suicide risk, related research suggests that higher levels of peer support and strong friendship ties are associated with less severe suicidal ideation and depressive symptoms and reduced risk of suicide attempts (Bearman & Moody, 2004; Lewinsohn et al., 1996; Slavin & Rainer, 1990). Among psychiatrically hospitalized adolescents, lower levels of peer support are associated with greater risk of suicide attempts and more severe suicidal ideation (Groholt, Ekeberg, Wichstrom, Haldorsen, 2000; Prinstein, Boergers, Spirito, Little, & Grapentine, 2000). Moreover, suicidal adolescents who experienced improved sense of peer connectedness soon after hospitalization were half as likely to attempt suicide one year after hospitalization (Czyz, Liu, & King 2012).

*History of Physical and Sexual Abuse:* Physical abuse and sexual abuse have been shown to be associated with suicidal ideation and behavior across community and clinical samples and in studies utilizing both longitudinal and cross-sectional designs (review by Miller, Esposito-Smythers, Weismoore, & Renshaw, 2013). Compared to non-abused children, those who were either physical or sexual abused were more likely to attempt suicide and experience suicidal ideation in addition to being at greater risk for psychiatric disorders and emotional-behavioral problems at ages 15 and 21 (Silverman, Reinherz, & Giaconia, 1996). Adolescents recruited from 8<sup>th</sup>, 10<sup>th</sup>, and 12<sup>th</sup> grade who reported physical abuse were two times more likely to experience suicidal ideation and were significantly more likely to have made a suicide attempt; specifically, they were five and 11 times more likely to have made a suicide attempt without and

with injuries, respectively (Bensley, Van Eenwyk, Spieker, & Schoder, 1999). Studies have shown that history of both physical and sexual abuse is associated with a significantly greater risk of suicidal ideation and suicidal behavior than either types of abuse alone, as is abuse by multiple perpetrators (Bensley et al., 1999; Plunkett, O'Toole, Swanston, Oates, Shrimpton, & Parkinson, 2002). A recent review suggest that these two types of abuse maintain an independent association with suicidal ideation and attempts in multivariate analyses, however some studies suggest that sexual abuse may be a stronger predictor of suicidal behavior than physical abuse (review by Miller et al., 2003).

#### Family Psychopathology:

Parental psychopathology, including depression, substance abuse, and antisocial behavior, confers significant risk for suicide attempts and suicides in adolescents (Brent et al., 2008). For example, relative to community controls, adolescents who died by suicide were more likely to have first-degree relatives with diagnoses of affective disorder, who abused drugs and/or alcohol, and who made a suicide attempt (Brent, Perper, Moritz, & Liotus, 1994). Specifically, adolescents who died by suicide were 11 and 10 times more likely to have family history of depression and substance abuse, respectively. In addition, adolescents whose mothers attempted suicide were seven times more likely to attempt suicide themselves and were also nine times more likely to attempt suicide when their father had a history of substance abuse (Pfeffer, Normandin, & Kakuma, 1998). In a sample of psychiatrically hospitalized suicidal adolescents, adolescents with had at least one parent with history of psychopathology were nearly twice as likely to attempt suicide one year after hospitalization (King et al., 2010). In addition to genetic heritability, parent psychiatric history may be associated with a significant risk of suicidal

behavior in adolescents due to environmental stressors such as interpersonal or parenting problems.

### **Assessment of Suicide Risk in Adolescents and Associated Challenges**

Assessment of suicide risk in adolescents can be challenging. As described, suicidal ideation is relatively common in adolescence and only a small proportion of youth attempt suicide, which makes accurate prediction of which adolescents will engage in actual suicidal behavior difficult. In fact, recent data from a national survey suggest that approximately one-third of adolescents (33.9%) who reported lifetime suicidal ideation made a suicide attempt (Nock et al., 2013). Moreover, suicidal ideation alone is not a reliable predictor of suicidal behavior for all teens. A longitudinal community study found that higher rates of suicidal ideation in adolescence (assessed with questions about thoughts of death or dying; wishing to be dead; thinking about hurting or killing self) were associated with suicide attempts in young adulthood for females, but not males (Lewinsohn et al., 2001). Similarly, in a psychiatric sample of suicidal teens, severity of suicidal ideation assessed at hospitalization predicted suicide attempts one year after discharge only for female adolescents (King et al., 2014). Inquiring about more severe aspects of adolescents' suicidal ideation—i.e. planning, which was not assessed in these two studies—may improve the prediction of risk for all adolescents. Indeed, in two factor-analytic studies, one of which included a predominantly male sample of young adults and another psychiatric inpatient adolescents, a factor reflecting resolved plans and preparation was more strongly associated with recent suicide attempts (Joiner, Rudd, & Rajab, 1997; Pettit et al., 2009) than a factor reflective of suicidal desires alone. Taken together, the limited predictive utility of suicidal ideation, especially for males who are at a higher risk for suicide (CDC, 2012), requires that additional risk factors that could improve suicide risk formulation are better

understood.

The challenge of accurately predicting suicidal behavior in adolescents calls for precise assessment methods to facilitate improved identification of at-risk youth. However, there is limited empirical data on the most accurate method of assessing adolescents' risk for suicide. Clinical practice guidelines for suicide risk assessment for adolescents, such as those outlined by King, Ewell Foster, and Rogalski (2013) and by the American Academy of Child and Adolescent Psychiatry (AACAP; 2001), emphasize the inclusion of information from multiple sources in the adolescent's life (adolescent, parents or guardian, school reports) and consideration of several key factors. These include suicide attempt history (especially when attempts involve more lethal methods—i.e. methods other than ingestion or superficial cutting), pervasive and frequent current suicidal ideation, presence of intent, substance use, and psychiatric disorders such as depressive and bipolar disorders, especially when comorbid with substance abuse. Lack of adequate social support, history of family psychopathology, history of physical or sexual abuse, presence of hopelessness or impulsivity are also important indicators of risk. Moreover, the guidelines stress consideration of an adolescent's current mental state, with particular attention paid to the presence of depressed, manic, hypomanic, or severely anxious mood, irritability, agitation, delusions, and hallucinations. Assessing the availability of means (such as firearms or lethal medication) is also strongly recommended as part of suicide risk formulation. These recommendations are primarily based on studies of individual risk factors as well as clinical knowledge. However, complete suicide assessment protocols based on clinical practice guidelines have not been evaluated empirically.

The involvement of the adolescent in the assessment of suicide risk is essential. It is noteworthy that community and clinical studies have found a disparity between adolescent and



parent reported suicidal ideation and attempts, with adolescents being more likely to report suicidal ideation, plans, and attempts (Klaus, Mobilio, & King, 2009; Prinstein, Nock, Spirito, & Grapentine, 2001; Walker, Moreau, & Weissman, 1990). Even among adolescents hospitalized for acute suicidal ideation or recent suicide attempt, a large percentage of parents appeared to be unaware of their children's suicidal thoughts and behaviors (e.g., Klaus et al., 2009). At the same time, the importance of gathering information from multiple sources should not be dismissed. While adolescents may be more likely to report suicide-related thoughts and behavior, a report from *either* adolescent or another informant indicating presence of suicidal thoughts or behavior has to be taken into account in suicide risk formulation.

Along similar lines, practice guidelines also emphasize utilization of multiple methods of assessment, including interviews, observations, and reliable and valid rating scales (AACAP, 2001). Incorporating different assessment method may be especially important since agreement between methods is low, and different methods may yield varied information. In particular, instruments based on adolescent self-report have been shown to identify a greater percentage of suicidal youths than clinical interviews (Prinstein et al., 2001), suggesting greater sensitivity of self-report instruments. Low agreement between clinician-rated and client-reported suicidal thoughts and behavior has also been found in the adult literature (Joiner, Rudd, & Rajab, 1999; Kaplan, Benbenishty, Waysman, & Solomon, 1992). It is possible that adolescents may perceive self-report measures as being more private than face-to-face interviews, thus promoting greater self-disclosure. Nonetheless, the difficulty with rating scales—whether self-report or a clinician-delivered—has to do with limited evidence of their predictive validity and, for the scales that have shown predictive validity, limited predictive value (Goldston, 2003; Huth-Bocks, Kerr, Ivey, Kramer, & King, 2007). This is highly problematic given that the primary intended, and

often stated, purpose of these instruments is to identify adolescents “at-risk” for future suicidal behavior (Goldston, 2003). Indeed, the AACAP practice guidelines (2001) caution against relying on rating scales, especially without considering information from the clinical interview.

There are many promising instruments designed to screen and assess suicide risk in adolescents (review by Goldston, 2003; King, et al., 2013). Unfortunately, many of these measures lack prospective data essential in establishing their predictive utility—and intended purpose to be used in predicting suicidal behavior (Goldston, 2003). Indeed, Goldston’s (2003) review of suicide risk instruments for adolescents identified only few instruments with demonstrated predictive validity in identifying risk of suicidal behavior. Suicidal Ideation Questionnaire (SIQ, Reynolds, 1988), one of the most widely used screening instruments in adolescents assessing severity of suicidal ideation, which has established predictive validity (e.g., King et al., 1995; 2010), is a notable example. Although additional studies examining the validity of some of these instruments, in addition to new scales, have been published in recent years, some of the limitations and criticisms highlighted by Goldston continue to be relevant.

One key criticism focuses on the problem of limited predictive validity, where measures predict suicide attempts only for some adolescent subgroups, but not others. For example, the Beck Hopelessness Scale (BHS) assessing negative expectations about the future (Beck & Steer, 1988), predicted suicide attempts (over nearly seven years) among psychiatrically hospitalized adolescents with a history of prior attempts; however, hopelessness was no longer predictive of attempts after controlling for severity of depression (Goldston et al., 2001). In the same study, the survival and coping beliefs subscale from the Reasons for Living Inventory (RFL) (Linehan, Goodstein, Nielsen, & Chiles, 1983), a scale assessing respondents’ potential reason for not killing themselves, was associated with a lowered risk for posthospitalization attempts, but again

only among adolescents with previous suicide attempts. Moreover, recent data on the predictive validity of the commonly used SIQ suggests that higher scores predicted suicide attempts 12 months after psychiatric hospitalization in previously hospitalized suicidal adolescent girls, but not boys (King et al., 2014). This highlights the need to consider not only if a measure has predictive validity but also for what subgroups it might be most or least useful. Another important criticism underscores the problem of limited predictive or clinical utility (i.e. sensitivity, specificity). For example, while the cutoff scores indicating increased risk on the BHS and the RFL survival and coping beliefs subscale yielded good sensitivity (85% and 83%, respectively), they had relatively poor specificity (48% and 49%, respectively) in predicting suicide attempts (Goldston et al., 2001)—calling into question their clinical utility. Likewise, while the Suicidality Probability Scale (SPS) (Cull & Gill, 1988)—which taps into hopelessness, suicidal ideation, negative self-evaluation, and hostility—was predictive of future suicide attempts (Larzelere, Smith, Batenhorst, & Kelly, 1996), the cut-off scores indicative of potential suicide risk would have also yielded low sensitivity (27.6% or 48.3% when using a different cutoff) in predicting attempts. However, it is worth noting that SPS showed higher sensitivity (80% based on published cutoff score) in predicting suicide attempts in a study of inpatient suicidal adolescents published since the review, which is described below (Huth-Bocks et al., 2007).

Since the publication of Goldston’s review, additional studies have examined the predictive validity of promising suicide risk instruments in adolescent samples. While a comprehensive review of these studies is beyond the scope of this introductory chapter, it is important to mention several notable studies. Huth-Bocks and colleagues (2007) reported on the convergent and predictive validity of a number of measures of depression, hopelessness, and

suicide risk in a sample of psychiatrically hospitalized adolescents. These measures included Reynolds Adolescent Depression Survey (RADS; Reynolds, 1987), BHS (Beck & Steer, 1988), Suicidal Ideation Questionnaire-Junior (SIQ-JR; Reynolds, 1988), and SPS (Cull & Gill, 1988). The authors reported that all four measures predicted suicide attempts six months later. Moreover, in evaluating the clinical utility of the four measures based on published and other cutoff scores, the authors reported moderate levels of sensitivity for all four measures and particularly low specificity for some (49% for RADS and 41% for SIQ-JR). The published SPS cutoff score yielded the strongest sensitivity and the most adequate specificity (80% and 57%, respectively) of all the four measures. Of significance is that when sensitivity was increased to approximately 90% based on different cutoff scores, this resulted in significantly reduced specificity for almost all measures, calling into question the extent of their clinical utility in predicating suicide attempts.

More recently, three studies (Posner et al., 2011; Gipson, Agarwala, Opperman, Horwitz, & King, 2015; Horwitz, Czyz, & King, 2014) have evaluated psychometric properties of the Columbia-Suicide Severity Rating Scale (C-SSRS; Posner, Oquendo, Gould, Stanley, & Davies, 2007). C-SSRS was first developed to track changes in suicidal thinking and behavior as part of the Treatment of Adolescent Suicide Attempters (Brent et al., 2011) study and is now commonly used in medication trials and recommended for use by the FDA. The scale assesses the full spectrum of suicidal ideation and behavior and contains definitions of terms to improve precise classification of suicidal events. The assessment of suicidal ideation includes a Severity Scale (ordinal scale ranging from wish to be dead to suicidal intent with plan) and an Intensity Scale (ordinal scale based on frequency, duration, controllability, deterrents, and reasons for ideation). C-SSRS also includes nominal categories of suicidal behavior (actual, interrupted, or aborted

suicide attempt, and preparatory acts) and non-suicidal self-injury. The existing studies have reported favorable psychometric properties of the C-SSRS for adolescents, including predictive validity (Gipson et al., 2015; Horwitz et al., 2014; Posner et al., 2011). In the Posner et al. (2011) study, C-SSRS Severity Scale scores based on lifetime “worst point” suicidal ideation predicted suicide attempts within 24 weeks in a treatment study of adolescent suicide attempters. In the Gipson et al. (2015) study, C-SSRS Intensity Scale scores, based on suicidal ideation within the last week, predicted suicide attempts among youths visiting a psychiatric emergency department at a subsequent visit across a one-year follow-up. Moreover, C-SSRS Severity Scale based on last week suicidal ideation and Intensity Scale (e.g. frequency, duration) predicted future suicide attempts among 15–24 year olds 18 months later (Horwitz et al., 2014). These findings provide support for the C-SSRS as a valid assessment instrument, however more data are needed to evaluate its clinical utility in predicting suicide attempts in suicidal adolescents.

Taken together, existing research provides some support for the usefulness of risk assessment instruments in evaluating risk in clinical populations of adolescents and differentiating those who will and will not attempt suicide in the future. However, these studies are limited in number and more prospective data are needed to provide additional support for predictive validity and utility of suicide risk assessment measures and protocols. In addition, studies that have reported suicide risk measures’ clinical utility (i.e. sensitivity and specificity) have shown that high levels of sensitivity (which is prioritized in suicide risk assessment) come at a cost of low specificity. This in part accounts for the challenge of accurately assessing suicide risk while minimizing false positives that may lead to unnecessarily restrictive and costly interventions (e.g., psychiatric hospitalizations). In an ideal case scenario, suicide risk assessment instruments would have very high sensitivity and capture all adolescents who are at

risk for suicidal behavior while maintaining high specificity reducing false positive identification. In reality, the problem of low specificity that applies to most existing measures, combined with the low rate of suicidal behavior, translates into difficulty in differentiating who is actually at a high risk for suicide. Therefore, among the most important challenges in accurately assessing suicide risk is ascertaining whether the measure or protocol has meaningful utility in predicting the future occurrence of suicidal behavior. In addition, not enough attention has been paid to incremental validity of these instruments, or the degree to which a particular measure provides new information that is not already available (Goldston, 2013). While incremental validity of measures has received some consideration—most notably in a previously described study by Huth-Bocks et al. (2007)—more research attention is still needed in this area. Thus, in addition to accuracy in differentiating high and low risk individuals, the utility of a suicide risk instrument or protocol also depends on its incremental value or ability to add new information that will aid in suicide risk detection.

### **Improving Prediction of Suicide Risk among Adolescents: Goals of this Dissertation**

Based on the review of existing literature, it is clear that the challenge of identifying suicide risk in adolescents calls for further study of potentially valuable assessment approaches and risk indicators that could meaningfully aid in the prediction of suicide risk, contribute clinical value to suicide risk formulation with at-risk youth, and ultimately help prevent youth suicide. In particular, more precise assessment approaches with demonstrated clinical utility and incremental value are needed. In addition, because predictive validity of suicide risk instruments, or individual risk factors, may not apply to all adolescent depending on specific demographic (e.g. adolescent boys; King et al., 2014) or clinical characteristics (e.g. those without history of previous attempts; Goldston et al., 2001), improving suicide risk prediction also requires

consideration of predictive validity in the context of potential subgroup differences.

These new efforts to are not reasonably going to offer an ideal solution to the problem of risk identification (e.g., eliminate false positives), but can be expected to incrementally improve identification of individuals who are truly at risk. The overarching goal of this dissertation study is to improve the accuracy of suicide risk prediction among adolescents who are most vulnerable to suicidal behavior and repeated suicidal crises and for whom accurate identification is especially critical: psychiatrically hospitalized suicidal adolescents and youth seeking psychiatric emergency services. Emergency Departments (EDs) serve large numbers of at-risk adolescents, particularly at-risk males, who are less likely to seek primary care services (Bertakis, Azari, Helms, Callahan, & Robbins, 2000; Marcell, Klein, Fischer, Allan, & Kokotailo, 2002; Wang, Lane, Olfson, Pincus, Wells, & Kessler, 2005) and economically disadvantaged patients for whom ED is the primary source of health care (Walls, Rhodes, Kennedy, 2002; Wilson & Klein, 2000). In addition, EDs frequently serve as the first-line of contact for most acutely suicidal adolescents or those who attempted suicide. Psychiatric inpatient units, on the other hand, serve adolescents who continue to be at a heightened risk for suicidal crises even after hospitalization, and are particularly vulnerable to repeated suicide attempts (e.g. Goldston et al., 1999). Proper risk assessment in these settings can inform decision-making about appropriateness of services at the time of assessment in an ED (e.g., psychiatric versus outpatient services) and whether to discharge a suicidal youth from inpatient care, in addition to informing risk monitoring to prevent subsequent suicidal crises after discharge.

This dissertation incorporates three studies examining: (1) the predictive validity and utility of an assessment approach incorporating youths' own assessment of their suicide risk in combination with clinician-administrated instrument; (2) the impact of post-hospitalization

course of suicidal ideation on subsequent suicidal crises, including suicide attempts and psychiatric rehospitalizations, and to identify the baseline predictors of a higher risk course after hospitalization; and (3) a suicide risk framework based on a promising theory of suicidal behaviors—the Interpersonal-Psychological Theory of Suicidal Behavior, which hypothesizes a proximal pathway to suicidal behavior based on three constructs (low belonging, high perceived burdensomeness, acquired capability for suicide)—to determine how well it predicts post-hospitalization suicide attempts within a sample of adolescents who were psychiatrically hospitalized for suicide risk. Concerned with improving the prediction of suicide attempts and relevant psychiatric crises (psychiatric hospitalization, return visit for psychiatric emergency services), the three studies consider predicative and incremental validity, predictive utility, and examined important subgroup differences (i.e. based on sex and multiple suicide attempt history) to help us better understand how to tailor assessment for suicidal youth. Each study is described in a separate chapter in the following sections.



## **CHAPTER II: Self-Rated Risk of Suicide Attempts (Study 1)**

Identifying individuals at elevated risk for suicidal behavior, with the goal of preventing suicidal deaths and the morbidity associated with suicide attempts, is a national priority. This requires effective and practical screening approaches that: (1) can capture individuals who are at elevated risk for suicidal behavior while minimizing false positives that lead to needlessly restrictive and costly interventions (e.g., inpatient hospitalization), and (2) can be practically implemented in settings, such as emergency departments (EDs), that have the potential to reach large numbers of at-risk individuals, particularly those who may otherwise not be identified (e.g., at-risk males).

There currently is an unmet need for suicide screening instruments and assessment approaches that have strong sensitivity in predicting future suicide-related behavior without compromising specificity (i.e. minimizing false positives). Many existing suicide risk assessment approaches have limited data on predictive validity and few have demonstrated clinically meaningful validity, resulting in too many false positives (Goldston, 2003; Huth-Bocks et al., 2007; King et al., 2013; Wintersteen, Diamond, & Fein, 2007). Some instruments may also not be practical for busy ED settings (Wintersteen et al., 2007).

While progress has been made in the area of suicide risk assessment, continued focus on effective and practical suicide risk assessment approaches is greatly needed. This need is especially salient for ED settings where the potential to serve and identify individuals at an elevated suicide risk is high while resources may be scarce (Cunningham et al., 2011; Doshi, Boudreaux, Wang, Pelletier, & Camargo, 2005). According to available estimates, suicide

attempt-related visits to EDs have increased in the US between 1992 and 2001 (Larkin, Smith, & Beautrais, 2008). EDs also treat large numbers of adolescents presenting with suicide attempts and self-inflicted injury (Ting et al., 2012). Suicidal youth are also commonly seen in psychiatric emergency settings, with over half of psychiatric ED visits being related to suicidal ideation or attempts (Horwitz et al., 2014). In addition, the recurrence of suicidal crises seen in EDs—which confers even greater risk for suicide deaths and more severe morbidity—provides further support for studying how we can improve identification of these youth in ED settings.

Recently, there have been notable efforts aimed at addressing the substantial need for tools assessing risk for suicidal behavior among adolescents seen in ED settings. For example, in a prospective study evaluating a multicomponent screening tool in a general medical ED (King et al., 2009), adolescents who screened positive for suicide risk based on recent suicidal behavior/current ideation plus depression and alcohol/substance misuse were significantly more likely to engage in suicidal behavior during a two-month follow-up period compared to adolescents screening positive based on one criterion (i.e. suicidal behavior/current ideation, depression, or alcohol/substance use) (King et al., 2015). In addition, two studies examining predictive validity of clinician-administered Columbia-Suicide Severity Rating Scale (C-SSRS; Posner et al., 2011) showed promising results among youth seeking psychiatric emergency services. Specifically, C-SSRS subscales assessing suicidal ideation severity (e.g. intent, method, plan) and intensity (e.g. frequency, duration) were associated with future suicide attempts among 15–24 year olds 18 months later (Horwitz et al., 2014). In a study of 13–17 year olds followed for 12 months, suicidal ideation intensity subscale (particularly, the item assessing duration) was a significant predictor of suicide attempts (Gipson et al., 2014).

In the current study, we expanded on previous work aiming to improve suicide risk

assessment strategies for adolescents and emerging adults seen in ED settings. Specifically, the goal of this study was to examine if asking youths seeking psychiatric emergency services to rate their own expectations of their suicide risk could improve how we identify high-risk youth. Recent research points to the clinical value of asking patients to self rate their own risk of self-harm behaviors, an approach that can improve suicide risk assessment and have relevance for EDs. Specifically, Peterson and colleagues (2011) found that asking adult inpatients with co-occurring mental illness and substance abuse problems to self rate their future risk of self-harm predicted self-harm eight weeks after discharge and two months later. Of significance is that this approach yielded clinically meaningful effect sizes, suggesting clinical importance and potential for improving existing risk management practices. However, an important limitation of this study was inquiring about “physical harm,” and thus not differentiating between suicidal and non-suicidal injury. In another study of adult inpatients, patients’ self-rated risk was also predictive of suicidal thoughts and behavior during hospitalization and three months post discharge (Roaldset & Bjorkly, 2010). However, the fact that the outcome was collapsed across suicidal thoughts and behavior makes interpretation of findings more difficult. In addition, Janis and Nock (2008) found that individuals’ self-rated expectations of risk predicted a combined suicidal and non-suicidal self-injury outcome six months later, but not over and above history of self-injurious behavior. To the best of our knowledge, only one study examined the extent to which self-rated expectations about future suicide-related behavior can predict suicide attempts among adolescents. In an inpatient sample (Goldston et al., 2001), adolescents’ ratings of the likelihood they would attempt suicide in the future predicted post-hospitalization suicide attempts seven years later—yielding sensitivity and specificity of 71% and 73%, respectively, and outperforming well-established measures such as the Beck Hopelessness Scale (Beck & Steer,

1988). These findings are consistent with other studies suggesting that, in general, people are able to accurately predict their behavior, including outcomes as varied as job performance, therapy outcome, adjustment following hospitalization, non-suicidal self-injury, and risk of violence (Glenn & Klonsky, 2011; Roaldset & Bjorkly, 2010; review by Shrauger & Osberg, 1981).

Eliciting patients' expectations of their risk of suicide-related behavior has implications for promoting greater therapeutic alliance and assessing patients' perception of their self-efficacy in managing suicidal crises. The construct of self-efficacy (Bandura, 1977)—which was developed as a component of social cognitive theory, but has since been widely used as a stand-alone construct—posits that belief in one's capability to succeed in a particular situation influences how a person will approach related challenges and will ultimately shape behavior. Self-efficacy is a powerful predictor of many health behaviors, such as management of diabetes, weight control, prevention of sexually transmitted diseases, and improved outcomes across all types of addictive behaviors (Multon, Brown, & Lent Multon, 1991; Hurley, & Shea, 1992; Maibach & Murphy, 1995; Witkiewitz & Marlatt, 2004). Expanding the theory to suicide risk, it is reasonable to hypothesize that individuals with low self-efficacy concerning their ability to manage suicidal crises or refraining from suicide-related behaviors might be more vulnerable to suicide-related behavior. Indeed, in a recent cross-sectional study of adults seeking residential substance use treatment, lower self-efficacy to refrain from suicidal action in different situations differentiated previous suicide attempters from non-attempters and was associated with more severe suicidal ideation (Czyz et al., 2014). Additional, longitudinal research is needed to examine these associations prospectively.

Anecdotal evidence suggests that clinicians are already asking, in one way or another, their patients to estimate if they can keep themselves safe, even though there is limited empirical evidence supporting this practice. This study will examine if adolescents who are in a psychiatric crisis are indeed able to provide meaningful predictions of their own risk and the extent to which this information can be used by clinicians conducting risk assessments. Examining the extent to which patients' self-rated expectations about suicide-related behavior predict actual behavior in a systematic way can thus improve existing assessment practices.

We expand on existing studies, which so far have mainly focused on inpatients and, with one exception, on adults, by using a large sample of psychiatric emergency adolescent patients who were followed for one year. We address some methodological limitations of previous work among adolescents (Goldston et al., 2011), such as relatively modest sample size and a lengthy follow-up period that may not correspond to clinical needs of assessing more immediate risk. We also explore the role of important moderators such as sex and history of multiple suicide attempts. These moderators may be crucial in determining for whom this approach could be most beneficial. For example, multiple suicide attempters might be more accurate or willing reporters in predicting their future risk of suicide-related behavior given that they have greater acquired capability for self-injury (Joiner, 2005; Van Orden, Witte, Cukrowicz, Braithwaite, Selby, & Joiner, 2010); in other words, they have habituated toward suicidal behavior, which potentially renders them more accurate reporters. It is also possible that, given their history, this group might report lower self-efficacy to refrain from suicide-related behavior. Finally, no studies have examined how self-rated suicide risk assessment performs *in combination with* clinician-administered assessments. It is possible that individuals' self-ratings of risk can meaningfully augment clinician-administered assessments and can be incorporated into suicide risk

formulations. Examining these questions using a highly naturalistic design could help inform how to improve suicide risk assessment strategies for patients seen in the ED, with important implications for treatment decision-making as well as minimizing unnecessary restrictive treatments.

### *Study Purpose*

1. To examine the predictive validity and utility (i.e. sensitivity and specificity) of a screening strategy that involves directly asking individuals (ages 13 to 24) who present for psychiatric emergency (PE) services to self rate their future risk of suicide-related behavior. The outcomes of interest include suicide attempts and return PE visits. As a subcomponent of this aim, in order to address practical concerns in busy ED settings (e.g. brief administration time, quick decision making), we considered which question(s) afford greater accuracy in predicting suicide attempts and return PE visits.

2. To examine if asking patients to rate their expectations of future risk of suicide-related behavior can improve upon a clinician-administered suicide risk assessment instrument—The Columbia Suicide Severity Rating Scale (C-SSRS)—in predicting suicide attempts and return PE visits. This will help further evaluate the value of incorporating patients’ risk perception into suicide risk formulation. We hypothesized that these patients’ own risk assessment *in combination* with C-SSRS would better predict psychiatric crises than clinician-driven assessments alone. Given that history of suicide attempts is the strongest risk factor for future suicide-related behavior (e.g., Goldston et al., 1999; Lewinsohn et al., 1996), we controlled for suicide attempt history.

3. To explore for which patient subgroups this approach has the most, or least, potential to be useful in predicting suicide attempts and return PE visits. In particular, the marked sex

differences in suicidality, with females being more likely to make suicide attempts and males being more likely to die by suicide (CDC, 2012), and the greater suicide risk among multiple suicide attempters (Goldston et al., 1999; Miranda et al., 2008) require that these factors be considered as key moderators.

### **Methods:**

#### *Participants:*

Participants included 340 adolescents and young adults (ages 13–24;  $M = 17.58$ ,  $SD = 3.27$ ; 63% were 18 and younger) seeking services from a university hospital's psychiatric emergency (PE) department in the midwestern region of the United States. All unique visits between November 15<sup>th</sup> 2012 and June 30<sup>th</sup> 2013 were considered as baseline visits. Return visits to PE and suicide attempts were tracked for up to 18 months later, through June 30<sup>th</sup> 2014. The mean length of the follow-up period was 486.74 days ( $SD = 62.01$ ). Exclusion criteria included non-residence in the local county served by the hospital's PE (individuals more likely to visit other emergency settings during the follow-up period) and presentation with an altered mental state (e.g., acute psychosis, intoxication) or cognitive impairment. In addition, those missing baseline Self-Assessed Expectations of Suicide Risk Scale ( $n = 118$ ) were excluded. There were no differences between those with and without the completed scale at index visit with regard to sex, race/ethnicity, insurance status (private versus public/no insurance used as proxy for socioeconomic status), age, suicide attempt history, or severity of suicidal ideation.

The sample included 142 (41.8%) males and 198 (58.2%) females. The racial/ethnic composition of the sample was as follows: 66.0% White, 19.7% Black; 3.2% Asian, 3.5% Hispanic, and 7.6% Other. Nearly 67% of participants were covered by private health insurance, 26% had publically-funded insurance (e.g. Medicaid), and 7% were not being covered by health

insurance. Nearly 60% of the initial visits (58.8%) were suicide-risk related (i.e. suicidal thoughts, suicide attempts). The majority of participants were discharged home (66.8%), approximately a third (32.1%) were psychiatrically hospitalized, and 1.2% were referred to partial-hospitalization or other intensive programs (e.g., residential treatment).

*Procedures:*

Following Institutional Review Board approval of this study, medical chart records were retrieved via an electronic record database. All data collected from chart reviews were deidentified and coded using a separate data form. Medical chart data were coded by two independent coders. A high inter-rater reliability was established prior to coding (Cohen's Kappa .78-.98).

*Measures:*

Self-Assessed Expectations of Suicide Risk Scale: The measure was used as a routine clinical assessment tool at the study site, with completed forms scanned into patients' electronic records. Three questions were developed to assess patients' own perception of their future risk of suicidal behavior: (Q1) "How confident are you that you WILL NOT attempt suicide in the future?," (Q2) "If you have serious thoughts of killing yourself in the future, how confident are you that you WILL BE ABLE to keep yourself from attempting suicide?," and (Q3) "If you have thoughts of killing yourself in the future, how confident are you that you WILL tell someone?" Answer choices ranged from 0 ("not at all confident") to 10 ("extremely confident"), with 5 serving as an anchor for "somewhat confident." Respondents also had the option to choose "Unsure" as a possible answer, since Roaldset and Bjorkly (2010) found that a "don't know" answer was meaningful in differentiating adult inpatients with more readmissions at three months. The first question was phrased in the negative direction, i.e. not attempting suicide, so



that we would not inadvertently press respondents to endorse commitment to engage in suicide-related behavior. In addition, to encourage more honest responses, we included a prompt before the three questions intended to attenuate shame related to suicidal behavior. The structure of the scale and response choices were based on scales assessing self-efficacy of other behaviors (Bandura, 2006; Maibach & Murphy, 1995). A copy of the measure is attached in the appendix.

Columbia Suicide Severity Rating Scale (C-SSRS; Posner et al., 2011): The C-SSRS is a clinician-administered instrument used as a routine clinical assessment tool, with completed clinician ratings being embedded in the medical record corresponding to PE visits. The C-SSRS is a 20-item, semi-structured interview that assesses different constructs of suicidality including: (1) the severity of ideation subscale, which is measured on a 5-point scale from “wish to be dead” to “suicidal thoughts” to “suicidal thought with a method” to “suicidal intent (without specific plan)” to “suicidal intent with plan;” (2) the intensity of ideation subscale, which has 5 items rated on a 5-point scale assessing frequency, duration, controllability, deterrents, and reasons for suicidal ideation; and (3) the suicidal behavior subscale, which, using a dichotomous scale, assessed actual, aborted, and interrupted attempts in addition to preparatory behavior and non-suicidal self-injurious behavior. The CSSR has been validated for use among clinical adult and adolescent populations based on a treatment study of adolescent suicide attempters, a medication trial with depressed adolescents, and adults presenting to ED with psychiatric problems (Posner et al., 2011) in addition to studies of adolescents and young adults visiting a psychiatric ED (Gipson et al., 2014; Horwitz et al., 2014). Baseline suicidal ideation in the last week was coded based on clinician-rated ideation severity score. History of suicidal behavior and follow-up suicidal behavior was also obtained from baseline and follow-up C-SSRS.

Electronic Chart Review: Additional information was collected from participants' medical chart, including demographic information (i.e. sex, race/ethnicity), psychiatric diagnoses, number of past psychiatric hospitalizations, reason for PE visit, type of suicide-related behavior at the time of visit, and disposition. For follow-up assessments, we collected information about number of return PE visits and reason for visits, number of psychiatric hospitalizations, and suicide attempts.

*Analyses:*

To examine the extent to which ratings on the Self-Assessed Expectations of Suicide Risk Scale were associated with time-to-return PE visits and time-to-suicide attempts during the follow-up period, we used a Cox proportional hazards regression in SPSS (version 21). This analysis allows for maximizing available data by censoring participants at the last available assessment date. Number of days to suicide attempt and number of days to return PE visit were used as a continuous measure of time. For each outcome, we build a step-wise model to illustrate the predictive validity of the total Self-Assessed Expectations of Suicide Risk Scale and then of each of the three questions separately. Those participants who did not return to PE were included in the analyses as non-attempters during the follow-up. We controlled for key covariates, including sex, history of multiple attempts, and severity of suicidal ideation (C-SSRS). Including severity of suicidal ideation in the model allowed us to examine the incremental validity of self-reported expectations over clinician-administered risk assessment. We also examined if the results were moderated by sex and history of multiple suicide attempts.

The clinical utility of the self-reported risk was examined using receiver-operating characteristic (ROC) curves, which allow for comparing the accuracy of different measures and provide information about sensitivity (or percent of true positives) and specificity (or percent of

true negatives) for different cutoff values of a measure. The area under the curve (AUC) of the ROC is used as an indicator of accuracy of a measure in predicting an outcome (attempt and return PE visit), with AUC of 1.00 reflecting accuracy of 100% and AUC of 0.50 reflecting a chance prediction. We also compared the combined predicative value of the Self-Assessed Expectations of Suicide Risk Scale and suicidal ideation severity (CSSRS) using the ROC curves relative to either measure. Predictive probabilities from Cox regression were used in ROC analyses to examine variables of interest independently and in combination.

## **Results**

### *Baseline Characteristics of the Sample:*

With regard to history of suicide attempts, a total of 218 (64.1%) participants had not attempted suicide prior to index PE visit, 73 (21.5%) had made one attempt, and 48 (14.1%) had a history of two or more attempts. Approximately 31% (n=106) of participants were previously hospitalized at least once. The mean suicidal ideation severity score on the CSSRS was 2.08 (SD=1.90); 62.6% (n=213) of participants endorsed at least some suicidal ideation at the time of the visit. Sex did not differentiate severity of baseline suicidal ideation; however, multiple suicide attempters (M=2.75; SD=1.98) reported more severe suicidal ideation compared to non-multiple attempters (M=1.97; SD=1.86),  $p=.008$ .

Participants received the following psychiatric diagnoses at the initial PE visit: a depressive disorder, including major depression or depressive disorder Not Otherwise Specified (NOS) (38.8%; n=131); a bipolar disorder (2.7%; n=9); mood disorder NOS (39.1%, n=133); adjustment disorder (5.3%; n=18); an anxiety-related disorder, including panic disorder, social anxiety, or anxiety NOS (20.1%; n=68); post-traumatic stress disorder (2.1%; n=7); a disruptive or impulse-control disorder (7.4%; n=25); attention deficit hyperactivity disorder (10.6%; n=36);

autism spectrum disorder (3.5%; n=12); an eating disorder (3.3%; n=11); a substance use disorder (15%; n=51); a psychotic disorder or schizophrenia (3.6%; n=12); and “other” disorder (0.06%; n=3).

*Follow-up Characteristic of the Sample:*

During the follow-up period, 114 (33.5%) of participants returned to the PE. Sixty-five percent of the follow-up visits were related to a suicide-related concern (n=74). Adolescents who returned to the PE were more likely to have a history of multiple suicide attempts (47.9% vs. 31.3%,  $\chi^2 [1, N=339] = 5.12, p = .024$ ), as were those who returned for a suicide-related concern (35.4% vs. 19.6%,  $\chi^2 [1, N=339] = 6.05, p = .014$ ). Thirty-nine participants (11.5%) attempted suicide at least once during the follow-up; multiple suicide attempters were more likely to attempt suicide at follow-up (25% vs. 9.3%),  $\chi^2 [1, N=339] = 10.01, p = .002$ . Moreover, 73 (21.5%) of participants were psychiatrically hospitalized at least once during the follow-up; these adolescents were also more likely to have a history of multiple suicide attempts (37.5% vs. 18.9%),  $\chi^2 [1, N=339] = 8.44, p=.004$ . Sex did not differentiate who returned to the PE, attempted suicide, or was rehospitalized during the follow-up.

*Self-Assessed Expectations of Suicide Risk:*

The mean total score for the three-item Self-Assessed Expectations of Suicide Risk Scale was 21.85 (SD=8.64). Inter-item correlations were high (.65-.89; See Table 2.1.). Chronbach’s alpha was .90. The total score did not differ between males and females; however, those with multiple suicide attempt history had lower total scores (M=17.64; SD = 9.72 vs. M=22.53; SD=8.26;  $p<.002$ ) compared to those without multiple suicide attempt history.

The following are the mean (M) and standard deviation (SD) for each of the three questions: (Q1) confidence to no attempt suicide (M=7.08; SD=3.23); (Q2) confidence about

ability to keep self from attempting suicide (M=7.47; SD=2.99); and (Q3) confidence about ability to tell someone about suicidal thoughts (M=7.21; SD=3.27). While sex did not differentiate those with lower and higher ratings on these items, differences were observed based on history of multiple suicide attempts. Specifically, those with multiple suicide attempt history rated themselves as having less (Q1) confidence to not attempt suicide (M=5.53; SD = 3.53 vs. M=7.33; SD=3.11; p<.001), (Q2) keep themselves from attempting suicide (M=6.11; SD=3.14 vs M= 7.68; SD=2.91, p=.001), and (Q3) tell someone about suicide thoughts (M=6.00; SD=3.71 vs. M=7.40; SD=3.16; p = .018 ) relative to multiple suicide attempters.

Only a small number of participants endorsed the “unsure” option on the three items: 11 participants (3.2%) on items assessing (Q1) self-rated confidence to not attempt suicide; 9 (2.6%) on item assessing (Q2) self-rated confidence about ability to keep self from attempting suicide; and 4 (1.2%) on item assessing (Q3) self-rated confidence about ability to tell someone about suicidal thoughts. Only one participant who endorsed the “unsure” answer choice attempted suicide during the follow-up period.

*Self-Assessed Expectations of Suicide Risk and Future Suicide-Related Events:*

Time-to-suicide attempt:

The results of the Cox regression model for time-to-suicide attempt are presented in Table 2.2. Participants’ scores on the Self-Assessed Expectations of Suicide Risk Scale (Step 2) significantly added to the predictive validity of the initial step that included sex, multiple attempt history, and suicidal ideation severity (change in  $\chi^2 = 11.21$ , p=.001), providing evidence for incremental validity. Results indicate that lower total ratings on Self-Assessed Expectations of Suicide Risk Scale were associated with greater risk of follow-up suicide attempts (Hazard

Ratio: 0.94,  $p = .001$ ). Neither sex nor history of multiple suicide attempts moderated this relationship.

As shown in Table 2.4, each question on the Self-Assessed Expectations of Suicide Risk Scale was independently associated with increased risk of future suicide attempts (Steps 2, 3, and 4), with lower scores on these questions being associated with higher risk of follow-up attempts. These associations also were not moderated by sex or multiple attempt history. It is important to highlight that when examined simultaneously (Step 5), the only significant predictor of suicide attempts was the question assessing (Q2) confidence about keeping self from attempting suicide (Hazard Ratio: 0.72,  $p = .017$ ).

#### Time-to-return PE visit:

The results of the Cox regression for time-to-return PE visit for suicide-risk related concern are shown in Table 2.3. In a stepwise model, a step of Self-Assessed Expectations of Suicide Risk Scale (Step 2) significantly added to the predictive validity of the initial step that included sex, multiple attempt history, and suicidal ideation severity (change in  $\chi^2 = 12.50$ ,  $p < .001$ ). Lower total ratings on Self-Assessed Expectations of Suicide Risk Scale were associated with greater risk of returning to PE for a suicide-risk related concern (Hazard Ratio: 0.95,  $p < .001$ ). This relationship was not moderated by sex or history of multiple suicide attempts.

As shown in Table 2.5, lower ratings on each of the Self-Assessed Expectations of Suicide Risk Scale items were again independently associated with increased risk of returning to PE for a suicide-risk related concern (Steps 2, 3, 4). When these predictors were examined simultaneously (Step 5), the question assessing (Q2) confidence about keeping self from attempting suicide was again the only significant predictor associated with follow-up suicide

attempts (Hazard Ratio: 0.77,  $p < .001$ ). There was a significant interaction between sex and the question assessing (Q3) confidence about telling someone about suicidal thoughts ( $B = -0.18$  [0.08],  $p = .018$ ). An exploration of this interaction suggested a significant association between higher scores on this item and lower risk of future return PE visit for females only ( $B = -0.14$  [0.04]; Hazard Ratio: 0.87,  $p = .001$ ).

### *Clinical Utility of Self-Assessed Expectations of Suicide Risk*

#### Follow-up Suicide Attempts:

When examining the accuracy of suicidal ideation severity (C-SSRS) alone, total Self-Assessed Expectations of Suicide Risk Scale alone, and their combination in predicting follow-up suicide attempts, the Area Under the Curve (AUC) values were 0.74 ( $p < .001$ ), 0.79 ( $p < .001$ ), and 0.80 ( $p < .001$ ), respectively. A comparison of these values based on the DeLong and colleagues' method (DeLong, DeLong, & Clarke-Pearson, 1988) showed that the difference between AUCs for CSSRS alone and in combination with total Self-Assessed Expectations of Suicide Risk Scale was statistically significant ( $p = .02$ ), indicating that Self-Assessed Expectations of Suicide Risk Scale improved the predictive accuracy of CSSRS.

Next, we examined each of the three Self-Assessed Expectations of Suicide Risk Scale questions, alone and in combination with CSSRS. The AUC values for (Q1) confidence to not attempt suicide, (Q2) confidence to keep self from attempting suicide, and (Q3) confidence to tell someone about suicidal thoughts were 0.77 ( $p < .001$ ), 0.80 ( $p < .001$ ), and 0.73 ( $p < .001$ ), respectively. The AUC for (Q2) confidence to keep self from attempting suicide was significantly greater than that for the first ( $p = .04$ ) and last ( $p = .02$ ) question. The AUC value for all three questions considered simultaneously was 0.80 ( $p < .001$ ), indicating the combined predictive value was not greater than that observed for (Q2) confidence to keep self from

attempting suicide. Based on significant differences between AUCs for CSSRS alone versus in combination, the results indicate that the accuracy of CSSRS considered alone (AUC= 0.74,  $p<.001$ ) was improved when combined with the question assessing (Q1) confidence to not attempt suicide (combined AUC = 0.78; difference at  $p=.02$ ) and the question assessing (Q2) confidence to keep self from attempting suicide (combined AUC = 0.80; difference at  $p=.01$ ).

Different cutoff scores for the Self-Assessed Expectations of Suicide Risk Scale questions yielding varying levels of sensitivity and specificity were derived from the ROC analyses and are listed in Table 2.6. We report sensitivity and specificity of individual items to aid the practical use of the scale in emergency settings. Another reason for considering individual items is that the question assessing (Q2) confidence about ability to keep self from attempting suicide was the strongest predictor of follow-up suicide attempts (Table 2.4) and its predictive accuracy matched that of the total score. The optimal cut-off score maximizing both sensitivity and specificity for this question, based on the point closest to upper left corner of the ROC curve, was 6.5; this cutoff point yielded a sensitivity of 79% with a corresponding specificity of 76%. We chose this cutoff point because we were interested in maximizing the accurate classification of suicide attempts (sensitivity) while simultaneously maximizing the accurate classification of non-suicide attempts (specificity). However, a different cutoff point could be chosen to maximize sensitivity if decreasing the probability of false negatives is more desirable – as the sensitivity of an instrument assessing suicide risk is often considered more important – though, as can be seen in Table 2.6, this would reduce specificity.

#### Return PE Visits for Suicide-Related Concerns:

For the return PE visits outcome, the AUCs for CSSRS alone, total Self-Assessed Expectations of Suicide Risk Scale alone, and their combination were 0.69 ( $p<.001$ ), 0.72



( $p < .001$ ), and 0.73 ( $p < .001$ ), respectively. The difference between AUC values for CSSR alone and CSSRS in combination with Self-Assessed Expectations of Suicide Risk Scale was significant ( $p = .03$ ).

When we examined each of the three Self-Assessed Expectations of Suicide Risk Scale questions, alone and in combination with CSSRS, the AUC values for (Q1) confidence to not attempt suicide, (Q2) confidence about ability to keep self from attempting suicide, and (Q3) confidence about ability to tell someone about suicidal thoughts were as follows: 0.70 ( $p < .001$ ), 0.73 ( $p < .001$ ), and 0.72 ( $p < .001$ ), respectively. The AUC value for (Q3) confidence about ability to tell someone about suicidal thoughts is reported for females only, as there was a significant interaction between sex and this question. There was a significant difference in AUCs between (Q1) confidence about ability to keep self from attempting suicide and (Q2) confidence to not attempt suicide ( $p = .04$ ). Based on significant differences between AUCs for CSSRS alone versus in combination, the results indicate that the accuracy of CSSRS considered alone (AUC = 0.68,  $p < .001$ ) was improved when it was combined with the question assessing (Q1) confidence to not attempt suicide (combined AUC = 0.72; difference at  $p = .04$ ) and the question assessing (Q2) confidence to keep self from attempting suicide (combined AUC = 0.74; difference at  $p = .01$ ).

Different cutoff scores derived from the ROC analyses and are listed in Table 2.6. We again focus on sensitivity and specificity of individual items to aid the practical use of the scale in emergency settings and given that the question assessing (Q2) confidence about ability to keep self from attempting suicide was the strongest predictor of return PE visits.

### **Discussion**

In a large sample of adolescents and young adults presenting for psychiatric emergency services, we examined the predictive validity and utility (i.e. sensitivity and specificity) of a

three-item screening tool that involves directly asking the youths to self rate their future risk of suicide-related behavior. We assessed the extent to which individuals' own risk estimation predicted suicide attempts and suicide-risk related return visits to the ED up to 18 months later and whether or not it improved the predictive accuracy of clinician-administered assessment. Given the importance of practical considerations for busy ED settings, we also examined which of the three questions afforded greater accuracy in predicting these outcomes. The current study provides initial evidence that adolescents presenting for psychiatric emergency services are able to provide meaningful predictions of their own risk of future suicidal behavior, which, in turn, augmented clinician suicide risk formulations.

The study results suggest that participants' ratings of their future risk of suicidal behavior were uniquely associated with a faster rate of suicide attempts and return visits for suicide-risk related concerns (i.e. suicidal ideation, suicide attempts) during the follow-up, even after taking into account participants' sex, history of previous suicide attempts, and severity of suicidal ideation at index visit. Specifically, total ratings indicative of lower confidence in maintaining safety from suicidal behavior were the only significant predictor of suicide attempts and return visits in multivariate analyses, pointing to benefit of considering youths' perspective in risk formulation. Moreover, an important finding is that one of the scale's items –the question assessing confidence to keep self from attempting suicide in the presence of suicidal thoughts – was the strongest predictor of time-to-suicide attempt and time-to-return visit. With regard to predictive utility, this question also yielded the most accurate prediction of attempts and return visits.

As may be expected, the predictive utility of the total Self-Assessed Expectations of Suicide Risk Scale, and its questions, was stronger for the suicidal attempt outcome. Notably,

whereas the AUC for the question assessing confidence to keep self from attempting suicide was in the good accuracy range (AUC=0.80), the scale's other two questions, as well as the clinician-rated suicidal ideation severity, yielded AUC values in the moderate range. This particular question's corresponding sensitivity and specificity (i.e. 79% and 76%, respectively) was higher than that sensitivity and specificity (i.e. 71% and 73%, respectively) reported for a question assessing expectations about future suicide attempts in the comparable study with adolescent inpatients (Goldston et al., 2001). It is possible that our use of a shorter follow-up period (up to 18 months vs. up to 7 years) and other methodological differences (ED versus inpatient sample, wording of questions used) may have accounted for the differences in predictive utility.

Another key finding was that self-rated expectations of suicide risk provided incremental validity in predicating suicide attempts and return visits over and above clinician-administered assessment of suicidal ideation severity and significantly improved its *accuracy*, suggesting their potential for augmenting suicide risk formulation. Consistent with our hypotheses, patients' own risk estimation *in combination* with clinician-administered ideation severity scale significantly increased the accuracy of predicting follow-up suicide attempts and return PE visits compared to the clinician-administered assessment alone. Notably, the clinician-administered ideation severity combined with *either* total Self-Assessed Expectations of Suicide Risk Scale or the single item assessing confidence to keep self from attempting suicide when experiencing thoughts of suicide yielded equivalent predictive accuracy. This provides evidence that incorporating this item into risk formulation might have greater practical value in ED settings when time constraints are of concern without compromising predictive accuracy.

Finally, we found that self-assessed expectations of suicide risk predicted suicide attempts and return PE visits for suicide-related concerns regardless of adolescents' sex and

history of multiple suicide attempts. The only exception pertained to the association between higher confidence to tell someone about suicidal thoughts and lower risk of return visit, which held for females only. It is possible that lower professional help-seeking behavior among males could in part account for the lack of association observed for males (Moller-Leimkuhler, 2002; Oliver, Pearson, Coe, & Gunnell, 2005). Despite well-documented sex differences in the prevalence of suicidal ideation and behavior (CDC, 2012; Nock et al., 2013), in general, self-assessed expectation appears to have similar predictive power of future suicide-related outcomes. As suggested elsewhere (Horwitz et al., 2014), youth who seek emergency services for psychiatric concerns may be more similar with regard to severity of clinical presentations regardless of sex. However, Goldston and colleagues (2001) similarly reported that inpatient adolescents' estimation of whether they will attempt suicide and actual behavior was not moderated by sex, suggesting that this pattern may be more constant across populations.

The fact that history of multiple suicide attempts also did not moderate the association between self-assessed expectations of suicide risk and suicide-related outcomes is also consistent with a previously published inpatient adolescent study (Goldston et al., 2001). It is notable that multiple suicide attempters rated themselves as having less confidence to not attempt suicide, keep themselves from attempting suicide in the presence of suicidal thoughts, and tell someone about suicidal thoughts. It is possible that those with previous suicide attempts have a lower sense of mastery to manage suicidal thoughts and urges, consistent with self-efficacy theory, wherein a key source of self-efficacy is previous successful performance (Bandura, 1977). However, our study suggests that youths with history of multiple suicide attempts were no more or less willing reporters or accurate in predicting suicide-related behavior.

Our study replicates previous research reporting predictive validity of self-rated

expectations regarding suicidal behavior (Goldston et al., 2001; Peterson et al., 2011; Roaldset & Bjorkly, 2010). This study also addresses important methodological limitations of previous work in this area. For example, Peterson and colleagues (2011) inquired about risk for self-harm more indirectly (e.g. “how concerned should your therapist be that you might cause physical harm to yourself”) and without differentiating between suicidal and non-suicidal injury. Others, while inquiring about risk directly (“what is your opinion of the risk that you will try to kill yourself” or “what do you think the likelihood is that you will make a suicide attempt in the future”), collapsed the outcome of suicidal thoughts and behavior (Roaldset & Bjorkly, 2010) or the outcome of suicidal and non-suicidal self-injury (Janis & Nock, 2008), which makes interpretation of findings more difficult. We are aware of only one study (Cha, Najmi, Park, Finn, & Nock, 2010) utilizing a psychiatric ED sample. While the authors did not find an association between adults’ prediction of suicide attempt risk and attempts six months later, the study included a smaller sample of participants (N=60) and may have been underpowered. We also add to the adolescent literature in this area. We replicate Goldston and colleagues’ (2001) findings among inpatient adolescents and expand on this work by utilizing a large number of high-risk youths in an ED setting, focusing on a shorter follow-up period that may correspond to need for assessing more immediate risk, including a balanced number of males and females, and examining the value of combining self-rated expectations with a clinician-administered assessment instrument.

*Study Implications:*

Findings suggest that self-rated expectations of suicidal behaviors may have clinical utility in predicting future suicidal behavior as well as suicidal crises that require return PE visits, even after information about suicidal severity and history of suicidal behavior has been obtained.

What is more, self-rated expectations provided good predictive accuracy and improved the accuracy of clinician-administered suicidal ideation instrument (CSSRS). These findings address an important research gap by informing that clinicians can incorporate patients' own perspectives of future risk into suicide risk conceptualization, although—as with any measure—they should not be used as a sole source of assessment. Anecdotally, clinicians ask patients to estimate their “safety” from taking suicidal action. This study adds to the literature by empirically testing the value of this practice in an actual clinical setting. It is important to highlight that self-rated expectations were predictive of suicide-related outcomes regardless of the fact that PE clinicians had access to these ratings. This suggests that adolescents and emerging adults may be willing reporters of their self-assessed risk.

Self-assessed risk questions appear to perform better than established measures of suicide risk. Based on comparison of AUC values, self-reported risk estimation examined in this study yielded greater accuracy in predicting later suicide attempts compared to Suicidal Ideation Questionnaire-JR, Beck Hopelessness Scale, Reynolds Adolescent Depression Scale, and Suicide Probability Scale (AUCs ranged between 0.63 and 0.73) reported in other clinical samples (Huth-Bocks, 2007). In this study, the question assessing confidence about ability to keep oneself from attempting suicide when having suicidal thoughts was an especially strong predictor of future suicide attempts and return PE visits. Indeed, its predictive accuracy was significantly higher than that of the other questions on the scale and than the clinician-assessed suicidal ideation. One possibility as to why the question assessing confidence to keep oneself from attempting suicide when experiencing suicidal thoughts was a stronger predictor of outcomes may be that it more precisely assessed confidence about coping with suicidal urges in the future. It assessed the *ability* to perform an action (i.e refrain from suicidal behavior) in a situation that

is proximal to suicidal behavior. Literature on self-efficacy theory suggests that asking about “ability” to perform a behavior under specific circumstances provides the best estimate of self-efficacy (Bandura, 2006), which, in turn, is a strong predictor actual behavior. Multon et al., 1991; Hurley, & Shea, 1992; Maibach & Murphy, 1995; Witkiewitz & Marlatt, 2004).

With particular relevance for busy ED settings, eliciting patients’ confidence about ability to keep themselves from attempting suicide if they experience thoughts of suicide offers good predictive utility with a single question while addressing practical administration concerns. Among youths who presented to PE department, a score of less than 6.5 on this question yielded the optimal cutoff for identifying the majority of youths who attempt suicide while minimizing false positives. Although it does not eliminate false positives, it offers improved specificity over other suicide risk measures in clinical samples (Huth-Bocks, 2007; Bocks, Goldston et al, 2001) and CSSRS examined in this study. An important question is whether the better predictive utility is due to the construct itself or some underlying characteristic, such as stability over time. A question for future research is how dynamic or static self-rated expectations are and how potential shifts in these perspectives might influence risk of suicide behavior. Future studies should also consider shorter follow-up periods to determine predictive utility of more acute or immediate risk.

With regard to treatment implications, expectations about future suicidal behavior can be indicative of youths’ self-efficacy beliefs to safely manage future suicidal urges. In this context, clinicians can help clients focus on developing coping strategies to increase their perception of being able to manage these thoughts and urges without acting on them. Inquiring about individuals’ beliefs to manage future suicidal crises has implications for promoting greater therapeutic alliance and providing an estimate of the extent to which an individual will be able to

sustain his or her coping efforts at the time of a suicidal crisis. This, in turn, could help guide further adjustment to the intervention (e.g., revising a safety plan) or decision-making about needed level of care (i.e. outpatient or inpatient services).

This study also adds to the broader literature addressing the larger goal of identifying and preventing suicidal behavior among high-risk youth. Because many existing suicide risk instruments do not provide predictive validity or have shown modest clinical utility (reviewed in Goldston, 2003; Huth-Bocks et al., 2007), there is a substantial need for assessment approaches with good predicate accuracy for identifying future suicide-related behavior. This need is especially salient in EDs serving large numbers of adolescents presenting to EDs with suicide-related concerns (Ting et al., 2012), which provides an important opportunity to help identify at-risk youth. Our study shows that assessing adolescents' own perceptions of risk appears to be clinically useful, feasible to implement in EDs, and, if replicated, promising for improving identification of youth at risk for future suicide-related outcomes.

*Limitations:*

This study has several important limitations. The sample was drawn from one hospital in the midwestern region of the United States, and thus the generalizability of the study's findings is limited. Due to the naturalistic nature of the study, inter-rater reliability data for clinician-administered C-SSRS is not available; however, all clinicians were trained in the administration of C-SSRS. The potential underestimation of follow-up suicide attempts is another limitation of the study, as participants who did not return to PE were considered to not have made follow-up suicide attempts. To safeguard against this limitation, we only included participants who resided in the local county for which the participating hospital provides the only PE services in the area. However, it is possible that participants may have moved or decided not to seek PE services



during a psychiatric crisis, and thus our estimate of suicide attempts is a conservative one.

Despite these limitations, the study has important strengths, including relatively large sample size and naturalistic design allowing for inclusion of all consecutive PE patients, which improve the generalizability of the results.

*Conclusions:*

In this study of adolescents and young adults seeking psychiatric emergency (PE) services, youths' ratings of their future risk of suicidal behavior uniquely predicted an increased risk of suicide attempts and return visits for suicide-risk related concerns up to 18 months later. Controlling for other covariates, ratings indicative of lower confidence to safely manage suicidal behavior were the only significant predictor of suicide attempts and return PE visits, pointing to the benefit of considering youths' perspective in risk formulation. Moreover, youths' self-rated expectations provided incremental validity in predicting suicide attempts and return visits over and above clinician-administered assessment of suicidal ideation severity and significantly improved its *accuracy*, suggesting their potential for augmenting suicide risk formulation. This naturalistic study suggested that youth presenting for PE services are able to provide meaningful predictions of their own risk of future suicidal behavior, which, in turn, can augment suicide risk formulation.

**Table 2.1** Correlations between the Self-Assessed Expectations of Suicide Risk questions and suicidal ideation severity

Variable	1. (Q1)Confidence to not attempt suicide	2. (Q2)Confidence about ability to keep self from attempting suicide	3. (Q3)Confidence about ability to tell someone about suicidal thoughts
1	-		
2	.89**		
3	.64**	.70**	

Note: \*\*p < .001

**Table 2.2** Cox regression model predicting time to suicide attempt for total Self-Assessed Expectations of Suicide Risk

<b>Variables</b>	<b>B</b>	<b>SE (B)</b>	<b>Hazard Ratio</b>	<b>95% CI</b>	<b>P</b>
<b>Step 1</b>					
Sex (male)	0.34	0.35	1.40	(0.71, 2.79)	n.s
Multiple Attempts (yes)	-0.75	0.36	0.47	(0.24, 0.95)	<b>.035</b>
Suicidal Ideation Severity	0.41	0.10	1.50	(1.24, 1.81)	<b>&lt;.001</b>
<b>Step 2</b>					
Sex (male)	0.35	0.35	1.42	(0.71, 2.82)	n.s
Multiple Attempts (yes)	-0.57	0.36	0.57	(0.28, 1.14)	n.s
Suicidal Ideation Severity	0.21	0.12	1.23	(0.98, 1.56)	.080
Self-Assessed Expectations of Suicide Risk Total Score	-0.07	0.02	0.94	(0.90, 0.97)	<b>.001</b>

Notes: Reference group in parentheses; N=324; CI = 95 Confidence Interval

**Table 2.3** Cox regression model predicting time to return PE visit for total Self-Assessed Expectations of Suicide Risk

<b>Variables</b>	<b>B</b>	<b>SE (B)</b>	<b>Hazard Ratio</b>	<b>95% CI</b>	<b><i>p</i></b>
Step 1					
Sex (male)	0.27	0.25	1.31	(0.80, 2.15)	n.s
Multiple Attempts (yes)	-0.58	0.28	0.56	(0.32, 0.98)	<b>.041</b>
Suicidal Ideation Severity	0.30	0.07	1.35	(1.18, 1.54)	<b>&lt;.001</b>
Step 2					
Sex (male)	0.31	0.25	1.36	(0.83, 2.23)	n.s
Multiple Attempts (yes)	-0.48	0.28	0.62	(0.36, 1.09)	.094
Suicidal Ideation Severity	0.15	0.08	1.16	(0.99, 1.36)	.075
Self-Assessed Expectations of Suicide Risk Total Score	-0.05	0.02	0.95	(0.92, 0.98)	<b>&lt;.001</b>

Notes: Reference group in parentheses; N=324; CI = 95 Confidence Interval

**Table 2.4** Cox regression model predicting time to suicide attempt for Self-Assessed Expectations of Suicide Risk questions

<b>Variables</b>	<b>B</b>	<b>SE (B)</b>	<b>Hazard Ratio</b>	<b>95% CI</b>	<b>p</b>
<b>Step 1<sup>a</sup></b>					
Sex (male)	0.22	0.34	1.25	(0.64, 2.43)	n.s
Multiple Attempts (yes)	-0.78	0.35	0.46	(0.23, 0.92)	<b>.028</b>
Suicidal Ideation Severity	0.39	0.10	1.48	(1.23,1.78)	<b>&lt;.001</b>
<b>Step 2<sup>b</sup></b>					
Sex (male)	0.26	0.34	1.30	(0.67, 2.54)	n.s
Multiple Attempts (yes)	-0.56	0.36	0.57	(0.28, 1.16)	n.s
Suicidal Ideation Severity	0.24	0.12	1.28	(1.02, 1.60)	<b>.034</b>
(Q1)Confidence about not attempting suicide	-0.15	0.06	0.86	(0.77, 0.96)	<b>.006</b>
<b>Step 3<sup>c</sup></b>					
Sex (male)	0.39	0.35	1.48	(0.74, 2.93)	n.s
Multiple Attempts (yes)	-0.65	0.36	0.52	(0.26, 1.05)	.067
Suicidal Ideation Severity	0.17	0.12	1.19	(0.94, 1.51)	n.s
(Q2)Confidence about keeping self from attempting suicide	-0.22	0.06	0.80	(0.72, 0.90)	<b>&lt;.001</b>
<b>Step 4<sup>d</sup></b>					
Sex (male)	0.29	0.34	1.33	(0.68, 2.60)	n.s
Multiple Attempts (yes)	-0.67	0.36	0.51	(0.26, 1.02)	.058
Suicidal Ideation Severity	0.29	0.10	1.34	(1.09, 1.64)	<b>.005</b>
(Q3)Confidence about telling someone about suicidal thoughts	-0.13	0.05	0.88	(0.80, 0.97)	<b>.007</b>
<b>Step 5<sup>e</sup></b>					
Sex (male)	0.46	0.36	1.58	(0.79, 3.18)	n.s
Multiple Attempts (yes)	-0.68	0.36	0.51	(0.25, 1.02)	.057
Suicidal Ideation Severity	0.20	0.12	1.22	(0.96, 1.55)	n.s
(Q1)Confidence about not attempting suicide	0.13	0.12	1.14	(0.90, 1.45)	n.s
(Q2)Confidence about keeping self from attempting suicide	-0.32	0.14	0.72	(0.56, 0.94)	<b>.017</b>
(Q3)Confidence about telling someone about suicidal thoughts	-0.01	0.07	0.99	(0.86, 1.14)	n.s

Notes: Reference group in parentheses; <sup>a</sup>N=339, <sup>b</sup>N=328, <sup>c</sup>N=330, <sup>d</sup>N=335, <sup>e</sup>N=324; CI = 95 Confidence Interval

**Table 2.5** Cox regression model predicting time to return PE visit for Self-Assessed Expectations of Suicide Risk questions

Variables	B	SE (B)	Hazard Ratio	95% CI	p
Step 1 <sup>a</sup>					
Sex (male)	0.22	0.24	1.25	(0.78, 2.02)	n.s
Multiple Attempts (yes)	-0.53	0.28	0.59	(0.34, 1.02)	.057
Suicidal Ideation Severity	0.28	0.06	1.33	(1.72, 1.51)	<b>&lt;.001</b>
Step 2 <sup>b</sup>					
Sex (male)	0.32	0.25	1.37	(0.84, 2.25)	n.s
Multiple Attempts (yes)	-0.49	0.28	0.61	(0.35, 1.07)	.082
Suicidal Ideation Severity	0.16	0.08	1.17	(0.10, 1.37)	.054
(Q1)Confidence about not attempting suicide	-0.13	0.04	0.88	(0.81, 0.96)	<b>.002</b>
Step 3 <sup>c</sup>					
Sex (male)	0.30	0.25	1.35	(0.83, 2.20)	n.s
Multiple Attempts (yes)	-0.48	0.28	0.62	(0.36, 1.07)	.084
Suicidal Ideation Severity	0.10	0.08	1.11	(0.94, 1.30)	n.s
(Q2)Confidence about keeping self from attempting suicide	-0.18	0.04	0.84	(0.77, 0.91)	<b>&lt;.001</b>
Step 4 <sup>d</sup>					
Sex (male)	0.29	0.25	1.34	(0.82, 2.18)	n.s
Multiple Attempts (yes)	-0.56	0.28	0.57	(0.33, 0.99)	<b>.047</b>
Suicidal Ideation Severity	0.22	0.07	1.25	(1.09, 1.44)	<b>.002</b>
(Q3)Confidence about telling someone about suicidal thoughts	-0.09*	0.04	0.92	(0.85, 0.98)	<b>.016</b>
Step 5 <sup>e</sup>					
Sex (male)	0.34	0.25	1.40	(0.85, 2.31)	n.s
Multiple Attempts (yes)	-0.53	0.28	0.59	(0.34, 1.03)	.063
Suicidal Ideation Severity	0.13	0.09	1.14	(0.97, 1.35)	n.s
(Q1) Confidence about not attempting suicide	0.08	0.09	1.08	(0.90, 1.30)	n.s
(Q2) Confidence about keeping self from attempting suicide	-0.26	0.10	0.77	(0.63, 0.95)	<b>.013</b>
(Q3)Confidence about telling someone about suicidal thoughts	0.02	0.05	1.02	(0.92, 1.13)	n.s

Notes: PE = Psychiatric emergency; Reference group in parentheses; <sup>a</sup>N=339, <sup>b</sup>N=328, <sup>c</sup>N=330, <sup>d</sup>N=335, <sup>e</sup>N=324; CI = 95 Confidence Interval; \*Significantly moderated by sex (B = -0.18 [0.08], p=.018), with significant effect for females only (B= -0.14 [0.04], p=.001)

**Table 2.6** Cutoff scores corresponding to sensitivity and specificity of the Self-Assessed Expectations of Suicide Risk questions

	Suicide Attempt vs. No Attempt			Return PE Visit vs. No Visit		
	Raw Score*	Sensitivity %	Specificity %	Raw Score*	Sensitivity %	Specificity %
(Q1)	-1	0	100	-1	0	100
Confidence to NOT attempt suicide	0.5	13	96	0.5	13	97
	1.5	13	92	1.5	16	94
	2.5	26	90	2.5	28	92
	3.5	42	84	3.5	35	85
	4.5	53	81	4.5	39	81
	5.5	74	73	5.5	58	75
	6.5	84	70	6.5	67	72
	7.5	84	66	7.5	68	68
	8.5	87	54	8.5	77	57
	9.5	92	41	9.5	81	42
	11	100	0	11	100	0
(Q2)	-1	0	100	-1	0	100
Confidence to keep self from attempting suicide	.05	8	98	0.5	7	98
	1.5	16	96	1.5	15	97
	2.5	32	93	2.5	25	94
	3.5	42	90	3.5	33	91
	4.5	50	85	4.5	39	87
	5.5	71	78	5.5	54	80
	6.5	79	76	6.5	61	77
	7.5	79	70	7.5	67	72
	8.5	87	61	8.5	74	63
	9.5	92	43	9.5	86	46
	11	100	0	11	100	0
<i>Females Only<sup>a</sup></i>						
(Q3)	-1	0	100	-1	0	100
Confidence to tell someone about thoughts of suicide	.05	16	97	0.5	11	99
	1.5	21	93	1.5	22	94
	2.5	34	89	2.5	38	92
	3.5	37	85	3.5	40	88
	4.5	47	82	4.5	44	85
	5.5	61	74	5.5	58	76
	6.5	68	70	6.5	64	72
	7.5	74	66	7.5	64	69
	8.5	76	56	8.5	67	62
	9.5	87	46	9.5	80	53
	11	100	0	11	100	0

Notes: \*Positive (yes) if less than or equal to a cutoff value; cutoff values are the averages of two consecutive ordered ratings (ratings range from 0-10); <sup>a</sup> shown for girls only due to significant interaction of sex and confidence to tell someone about thoughts when predicting return PE visits

### **CHAPTER III: Longitudinal Trajectories of Suicidal Ideation among Adolescent Inpatients and Subsequent Suicidal Crises (Study 2)**

Psychiatrically hospitalized adolescents are at particularly elevated risk for suicidal behavior. A considerable proportion of these youths continue to experience suicidal ideation and engage in repeated suicidal behavior following hospitalization (Goldston, et al., 1999; King, et al., 1995; Prinstein, Nock, Simon, Aikins, Cheah, & Spirito, 2008), which places them at an increased risk for eventual suicide. A period of particularly high risk for suicide attempts is within the first 12 months after hospitalization (Goldston et al., 1999). In addition, a recent study of previously hospitalized teens found that a significant percentage of these teens were at a high risk for suicide risk-related events, such as emergency department visits (23%) and inpatient hospitalizations (28%) six months after hospitalization (Yen et al., 2013). Preventing suicide-related behavior among psychiatrically hospitalized teens requires a better understanding of which adolescents are most at risk for continued suicidal crises and how to better identify these youth and improve their post-hospitalization functioning.

Surprisingly little is known about longitudinal patterns of suicidal ideation, one of the immediate precursors to suicide attempts, among recently discharged adolescent inpatients. Some of the key unanswered questions include the extent to which, and for whom, these patterns change or are relatively stable after hospitalization. Findings from community studies demonstrate that suicidal ideation tends to persist over time, even into adulthood, and is associated with poor functioning in many life domains and suicide attempts (Fergusson, et al., 2005; Herba, Ferdinand, van der Ende, & Verhulst, 2007; Lewinsohn et al., 1994; Reinherz et



al., 2006). Among psychiatric adolescents, severe suicidal ideation assessed at the time of hospitalization has also been implicated as a strong predictor of post-hospitalization suicide attempts six months to a year later (Huth-Bocks et al., 2007; King, et al., 1995, 2010). Few studies, however, have examined the longitudinal *course* of suicidal ideation beyond two assessment time points among psychiatrically hospitalized teens and how these trajectories may impact future risk of suicide attempts. A better understanding of the course of suicidal ideation following a suicidal crisis could have significant implication for improving how to identify those most likely to engage in suicidal behavior post-hospitalization and intervene with these adolescents to minimize subsequent suicidal crises.

To the best of our knowledge, only one study investigated the course of suicidal ideation among psychiatrically hospitalized adolescents who were followed for 18 months (Prinstein et al., 2008). It is noteworthy that the sample included suicidal and non-suicidal adolescents, and thus the findings may not directly apply to adolescents hospitalized for acute suicide risk. The authors found that there was a sharp decrease in suicidal ideation during the first six months after hospitalization, which then gradually reemerged between nine and eighteen months after hospitalization. The significance of these fluctuations is that increases in suicidal ideation were associated with subsequent increases in the risk of a suicide attempt. Moreover, of significance is that specific factors in this study maintained elevated suicidal ideation. Specifically, higher depressive symptoms and higher levels of non-suicidal self-injury measured at the time of hospitalization were found to be associated with less pronounced decreases in suicidal ideation right after hospitalization. In contrast, externalizing disorders (conduct and oppositional defiant disorders) were associated with more of a decrease in suicidal ideation over time. Interestingly, the decreasing pattern of suicidal ideation within six months of hospitalization was also found in

a recent study of suicidal inpatient adolescents whose retrospective ratings of weekly suicidal ideation over a course of six months showed a reduction in suicidal thinking during the follow-up (Selby, Yen, & Spirito, 2013).

An important question that has not been addressed is whether there are different trajectory groups among previously hospitalized adolescents, as opposed to the single trajectory that was reported by Prinstein and colleagues (2008). For example, some adolescents may follow a decreasing and then increasing pathway, as described in Prinstein et al.'s study, while others may follow a continuously decreasing pathway. There may also be a subgroup that has a more stable or chronic pattern of suicidal ideation over time. In fact, a study involving adolescents from the community, assessed at age 14, 15, and 17, identified three different suicidal ideation trajectory subgroups –no ideation, decreased ideation, and persistent or increased ideation –rather than a single group (Reuter, Holm, McGeorge, & Conger, 2008). These authors examined the association between the three trajectories and risk of suicidal behavior across a 10-year period, reporting that adolescent females in the increasing ideation group and males in the decreasing ideation group had the highest probability of attempting suicide. It is unclear, however, the extent to which these findings would be directly relevant to psychiatrically hospitalized teens who tend to experience more severe suicidal ideation, are at higher risk for suicide attempts, and for whom mapping a more short-term course of ideation might be of greater significance given that they are particularly vulnerable to suicidal behavior after hospitalization. In addition, this study did not explore what factors predicted membership in the three trajectory groups that were identified.

#### *Study Purpose*

Mapping the course of suicidal ideation post hospitalization may have an advantage over considering suicidal ideation only at the time of hospitalization: A better understanding of longitudinal patterns of suicidal ideation following hospitalization, and the degree to which this course is uniform or different among subgroups, may help inform which adolescents are at the greatest risk of post-hospitalization suicidal behavior. The purpose of this study was to examine if acutely suicidal inpatient adolescents who had been recently discharged follow different suicidal ideation trajectories post hospitalization, and the extent to which these trajectories are associated with future suicide attempts and psychiatric rehospitalization; we examined if this effect will hold over and above history of prior suicide attempts, which is the strongest predictor of suicide-related behaviors (Bridge et al., 2006; Goldston et al., 1999). We hypothesized that there will be at least two distinct trajectory groups: a decreasing suicidal ideation group and a persistent or chronic group. In addition, we also anticipated there may be a third group that is following a decreasing and then increasing pathway, as described in Prinstein et al.'s (2008) study. We expected that teens in the persistent or chronic suicidal ideation group will be at greatest risk for suicide attempts and for rehospitalization. Moreover, recent evidence suggests that suicidal ideation at the time of hospitalization was a significant predictor of suicide attempts one year later for adolescent girls, but not boys (King et al., 2014), providing additional support for considering the severity of suicidal ideation beyond index hospitalization to improve identification of all at-risk adolescents. To this effect, we examined if the influence of group trajectories on likelihood of suicide attempts and rehospitalization is moderated by sex. We also examined the moderating effect of multiple suicide attempt history, as teens who attempt suicide more than once have the highest risk for future suicide attempts after hospitalization relative to suicide ideators or one-time attempters (Goldston, et al., 1999; Miranda et al., 2008). Finally, we

explored what risk and protective factors assessed at the time of hospitalization predict membership in suicidal ideation trajectories. We build on previous studies by considering the influence of several important correlates of suicidal thoughts and behavior, including adolescents' sex, multiple suicide attempt status, depressive symptoms, externalizing problems, substance use, hopelessness, history of parental psychopathology, history of physical and sexual abuse, and family and peer connectedness (Borowsky, et al., 2001; Bridge, et al., 2006; King & Merchant, 2008; Lewinsohn, et al., 1996).

### **Methods**

#### *Participants:*

Participants were 376 adolescents who had been psychiatrically hospitalized due to acute suicidal ideation or attempt and were subsequently followed for one year. The sample was drawn from a randomized clinical trial of a psychosocial intervention—Youth-Nominated Support Team-II (YST-II)—for suicidal adolescents following hospitalization (King et al., 2009). The original study included 448 adolescents, ages 13 to 17. Inclusion criteria were adolescent or parent reports of recent (within 4 weeks) 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 recent suicide attempt, both taken from the Diagnostic Interview Schedule for Children (DISC-IV) (Shaffer, Fisher, Lucas, & NIMH DISC Editorial Board, 1998). Exclusion criteria included severe cognitive impairment, direct transfer to a medical unit or a residential placement, distance of more than one hour that preclude travel, and unavailability of a legal guardian.

Adolescents were included in the present study if they had baseline data for suicidal ideation and completed at least one follow-up assessment three, six, or 12 months after

hospitalization. Participants were predominantly female (72%) with a mean age of 15.6 years (SD=1.31). The racial/ethnic composition of the sample was approximately 83% Caucasian, 7% African-American, 0.5% Asian-American/Pacific Islander, 2% Hispanic, 0.5% Native American, and 7% “Other” or not identified. The annual income of adolescents’ families ranged from less than \$15,000 (6% of families) to more than \$100,000 (17% of families), with the median annual family income between \$40,000 and \$59,000. Further, 10% of participants lived in families where at least one parent received public assistance. Participants with and without follow-up data did not differ significantly on important demographic variables (i.e. sex, age, race, use of public assistance) and the primary variable of interest, baseline suicidal ideation, and suicide attempt history. In addition, adolescents assigned to YST-II, versus usual care only, did not have a significantly different rate of suicide attempts during the 12-month follow-up.

*Procedures:*

Participants were recruited from a university hospital or a private hospital in the midwestern region of the United States. Study eligibility criteria were determined based on hospital admission records, and adolescents meeting study criteria were approached to participate in the study. Parents or guardians of eligible adolescents provided written informed consent and adolescents provided informed assent. Participants were assessed at during or within one week of hospitalization, and follow-up data (3, 6, and 12 months later) were collected at an outpatient office adjacent to the hospital or in the participants’ homes. Participating adolescents and parents were compensated \$30 and \$20, respectively, for completing each assessment. The study was approved by the participating university’s Institutional Review Board.

*Measures:*

Suicide Attempts: Lifetime multiple attempt status, assessed at baseline, and suicide attempts at each of the follow-up points were assessed using suicide attempt items from the DISC-IV (Shaffer, et al., 1998). The presence of suicide attempts was assessed with the question “Have you ever, in your whole life, tried to kill yourself or made a suicide attempt?” (yes/no). The time frame was adapted to capture the appropriate assessment window at each follow-up assessment.

Suicidal Ideation: Severity of suicidal ideation was assessed with the *Suicidal Ideation Questionnaire-Junior* (SIQ-JR) (Reynolds, 1988), a 15-item self-report questionnaire that measures frequency of a range of suicidal thoughts. Frequency of suicidal thoughts is rated on a 7-point scale ranging from “I never had this thought” to “almost every day.” Total score can range from 0 to 90, with a published clinical cut-off score of 31. The SIQ-JR has solid, well-documented psychometric properties (Reynolds, 1988, 1992) and has been found to predict suicidal thoughts and attempts six months after psychiatric hospitalization in a sample of adolescents (King et al., 1995).

Psychiatric Rehospitalization: A dichotomous variable was created (yes/no) based on two questions inquiring if a participant was in a psychiatric hospital or a general hospital for psychiatric or emotional problems since the last assessment. The time frame was adapted to capture the appropriate assessment window at each of the follow-up assessments. A positive response to either question was coded as a “yes.”

Depressive Symptoms: The *Children’s Depression Rating Scale-Revised* (CDRS-R) (Poznanski & Mokros, 1996) was used to measure depressive symptoms within the previous two weeks. The CDRS-R is a semi-structured interview that assesses a broad range of depressive symptoms grouped into 17 areas, such as Appetite Disturbance, Sleep Disturbance, Social

Withdrawal, or Depressed Feelings. Items are rated on a 5- or a 7-point scale and scores range from 17 to 113. The measure has strong psychometric properties in studies with adolescents (e.g., Emslie et al., 1997; Shain, Naylor, & Alessi, 1990). Inter-interviewer reliability for total scores, assessed prior to data collection, was high (mean alpha across raters of .98).

Hopelessness: *The Beck Hopelessness Scale* (BHS) (Beck & Steer, 1988) is a 20-item, true/false self-report questionnaire that was used to assess negative attitudes about the future. Scores range from 0 to 20, with higher scores indicating greater hopelessness. Example items include “I don’t expect to get what I really want” and “My future seems dark to me.” The BHS has been shown to predict eventual suicides in adult psychiatric inpatients and outpatients in the original sample and has also demonstrated strong psychometric properties in adolescent samples (Goldston, et al., 2001).

Externalizing Symptoms: The externalizing problems scale from Youth Self-Report (YSR) (Achenbach, 1991) was used to assess externalizing behavior problems. YSR is a 119-item, questionnaire that assesses a variety of emotional and behavioral problems in adolescents. It is a widely used measure with strong psychometric properties; its two scales (internalizing and externalizing) have demonstrated strong psychometric properties, including internal consistency, test-retest reliability, and criterion and construct validity (Achenbach, 1991; Thurber & Hollingsworth, 1992). The externalizing problems scale has items such as “I destroy my own things” and “I disobey my parents.” Adolescents rate each item by selecting responses from 0 (not true) to 2 (Very true or often true).

Substance Use: *The Personal Experiences Questionnaire* (PESQ) (Winters, 1991, 1992) is a 41-item self-report questionnaire used to screen for abuse of alcohol or other substances in adolescents. 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?” The problem severity scale used in this study consists of 18 items assessing the frequency with which adolescents engage in behaviors related to alcohol and drug abuse using a four-point scale (never to often); scores range from 18 to 72. It showed adequate reliability and validity for identifying problem substance use in the original sample (Winters, 1992)

Connectedness: Perception of connectedness was measured with items from the *Perceived Emotional/Personal Support Scale (PEPPS)* (Slavin, 1991), which assesses the degree to which respondents perceive their relationships as close, confiding, satisfying, and supportive. Participants listed initials of up to three people in each relationship domain (family members, friends, and non-family adults) and, using a four-point scale ranging from “hardly at all” to “very much, rated how much they talk to each person about personal concerns, how close they feel to the person, and how satisfied they are with the help and support the person gives them. Three connectedness subscales corresponding to each relationship domain were created by averaging all ratings within each relationship category, with higher scores indicating greater connectedness. PEPPS has reasonably high test-retest reliability and internal consistency for the subscales (.83 for family, .91 for peer, and .89 for non-family adult) in an adolescent sample (Slavin, 1991).

Family Psychiatric History: *The Family History Screen (FHS)* (Weissman, Wickramaratne, Adams, Wolk, Verdelli, & Olfson., 2000) was used to assess psychiatric histories of adolescent’ biological parents. Information was obtained from a biological parent or legal guardian. The FHS has 24 items and has demonstrated acceptable validity and reliability. A dichotomous variable indicative of parental psychopathology was created based on positive response to two questions asking if either parent:(1) “ever had an emotional problem or mental illness” and (2) “had ever sought treatment with a psychiatrist, psychologist, social worker,



doctor, or other health professional because of a mental health problem.” Chronbach alpha for these FHS items is .80 for fathers and .78 for mothers.

History of Physical and Sexual Abuse: History of physical and sexual abuse was assessed with two items from the *Schedule for Affective Disorders and Schizophrenia for School-Age Children* (KSADS-PL) (Kaufman et al., 1997). More specifically, the items were drawn from the KSADS-PL Post-Traumatic Stress Disorder module including screening questions about experience of different traumatic events. KSADS-PL is a structured diagnostic interview based on the DSM-IV. Interviewers were trained mental health professionals who completed 20 hours of training in KSADS-PL; inter-rater reliability was established with a senior diagnostician prior to study onset. Each of the two abuse history variables was dichotomous.

#### *Data Analysis*

Latent class growth modeling (LCGM) was used to identify distinct latent trajectories of suicidal ideation across time (4 time points: baseline, 3-, 6-, and 12- months after hospitalization) as well as predictors of belonging to each latent growth class. Data were analyzed using the PROC TRAJ procedure (Jones & Nagin, 2007; Jones, Nagin, & Roeder, 2001) in SAS (version 9.2). This analytic approach identifies different latent trajectory classes, where individuals in a given class follow a distinct pattern of change over time, and simultaneously examines predictors of class membership within the same modeling framework. Unlike standard growth modeling procedures, this analysis does not assume a particular type or number of trajectories a priori but rather examines what trajectory classes are in the available data. In addition, it does not expect that individuals change in the same direction across time; instead, participants are allowed to follow different growth patterns with varying strength and direction of change over time, forming discrete trajectory classes (Andruff, Carraro, Thompson, Gaudreau, & Louvet, 2009).

We initially fitted models without any risk factors included to explore possible trajectory classes (allowing for linear, quadratic, or cubic trends in any given class) to identify the best-fitting and most parsimonious preliminary model. The Bayesian information criterion (BIC) was used to select the best fitting model from a series of models including different numbers of trajectories. BIC performs very well as an indicator for deciding on the number of classes in mixture modeling (Nylund, Asparouhov, & Muthen, 2007). We then simultaneously entered into the model key risk and protective factors measured at hospitalization (sex, history of multiple suicide attempts, depressive symptoms, substance use, externalizing problems, hopelessness, social connectedness measured separately for family and friends, parental psychiatric history, and physical and sexual abuse history). These risk factors were entered to determine predictors of membership in the identified trajectory groups. Given that the original sample came from an intervention study, we also controlled for the potential effect of intervention; however, the intervention had only a modest positive effect on suicidal ideation that was time-limited (found for multiple suicide attempters during the initial 6 weeks after hospitalization) and no effect on the likelihood of suicide attempt (King et al., 2009).

To obtain the most parsimonious model, backward selection was used by deleting the least significant risk factors one at a time, while including and then leaving out sex (due to there being more girls than boys; however, there was no difference between models with and without sex included). The significance level was set at  $p < .05$ , and multi-parameter Wald tests implemented in PROC TRAJ were used to examine the omnibus importance of a given risk factor in determining overall class membership.

To examine the degree to which the distinct trajectory groups identified in the LCGM were associated with the likelihood of suicide attempts and psychiatric rehospitalization during

the follow-up, logistic regression was used. In both models, sex, multiple attempt history, and treatment group were entered in the first step of logistic regression, trajectory group was entered in the second step, and each two-way interaction between the latent group variable and sex and then multiple attempt status was entered in step tree. Intervention group was included as a covariate but was removed from the final model because it was not a significant predictor and results did not vary with it in the models.

## **Results**

### *Characteristics of the Sample:*

Baseline and follow-up SIQ scores, in addition to sample size at each assessment time point, are provided in Table 3.1. Female adolescents had significantly higher SIQ scores than males at each assessment time point, and adolescents with multiple suicide attempt histories also tended to have higher SIQ scores with the exception of the 12-month assessment time point. The following are means (M) and standard deviations (SD) of additional baseline characteristics: depressive symptoms (M=60.85; SD=12.97); externalizing problems (M=21.40; SD=9.69); substance abuse (M=28.15; SD=11.57); hopelessness (M=8.74; SD=5.78); family connectedness (M=8.29; SD=2.12); and friend connectedness (M=9.90; SD=1.90). History of mental health problems was endorsed for mothers of 160 (43%) participants and for fathers of 103 (27%) adolescents; for 55% of adolescents (n = 207), at least one parent had a history of mental health problems. History of physical abuse was reported by 75 (20%) of the sample while sexual abuse was reported by 85 (23%) of participants. Prior to baseline, 91 (24%) of adolescents had not attempted suicide, 135 (36%) had made one attempt, and 150 (40%) had a history of two or more attempts. In addition, 63 adolescents (17%) made at least one suicide attempt during the follow-up; adolescents with multiple attempt histories were more likely to attempt suicide (23% vs.

14%),  $\chi^2 (1, N=354) = 4.27, p = .04$ . Moreover, 135 (36%) of adolescents were psychiatrically rehospitalized at least once during the follow-up; these adolescents were more likely to have history of multiple suicide attempts (54% vs. 40%),  $\chi^2 (1, N=294) = 5.43, p=.02$ . Sex did not differentiate who attempted suicide or was rehospitalized during the follow-up.

#### *Latent Class Growth Models:*

The best fitting model included three distinct classes (BIC: -5547.88), providing a better fit relative to models with a different number of classes, such as two- (BIC: -5600.73) or four-class models (BIC: -5548.81). As shown in Figure 3.1, the three distinct latent groups were: (1) a quadratic trend group with sub-clinical suicidal ideation (n=119; 31.6%); (2) a cubic trend group with high suicidal ideation at hospitalization but sharp decline three months later (n=216; 57.4%); and (3) a linear trend group with high suicidal ideation at baseline that was elevated throughout the follow-up (n=41; 10.9%). There were 77 females (64.7%) and 42 males (35.3%) in Group 1, 161 females (74.5%) and 55 males (25.5%) in Group 2, and 34 females (82.9%) and 7 males (17.1%) in Group 3. There were 34 (28.6%), 94 (43.5%), and 22 (53.7%) multiple suicide attempters in Group 1, 2, and 3, respectively.

#### Bivariate Analysis:

Several risk and protective factors were added to the model to identify predictors of latent growth class membership. Almost all predictors were significant in bivariate analyses: sex (F=3.62, p=.03); multiple suicide attempt status (F=5.59, p=.004); depressive symptoms (F=18.65, p<.0001); externalizing problems (F=11.12, p<.0001); hopelessness (F=18.03, p<.0001); substance abuse (F=4.08, p=.02); history of physical abuse (F=3.32, p=.04) and history of sexual abuse (F=3.43, p=.03). Parental history of mental health problems,

connectedness with family, and connectedness with friends were not statistically significant. We also adjusted for potential effect of the intervention; it was a non-significant predictor.

Table 3.2 shows the relative importance of the significant bivariate predictors in differentiating between trajectory classes. Relative to Group 2, Group 1 membership was associated with less severe baseline depressive symptoms, externalizing problems, hopelessness, and substance abuse in addition to lower likelihood of being female, history of multiple suicide attempts, and history of sexual abuse. The same pattern was observed when comparing adolescents in Group 1 relative to Group 3, however substance abuse and history of abuse history no longer differentiated these two groups. Relative to Group 3, membership in Group 2 was associated with less severe baseline hopelessness and lower likelihood of physical abuse history.

#### Multivariate Analysis:

All predictors and intervention group were subsequently entered into a full model. Backward selection was used to simplify the model by deleting the least significant risk factors one at a time to obtain the most parsimonious model; there was no difference between models with and without sex and intervention group included. Using multi-parameter Wald tests to examine the omnibus importance of a given risk factor in determining overall class membership, the following were significant predictors of class membership and were included in the final model (see Table 3.3): depressive symptoms ( $F=8.17$ ,  $p<.001$ ); externalizing problems ( $F=6.11$ ,  $p=.002$ ); and hopelessness ( $F=15.73$ ,  $p<.0001$ ). As described in Table 3.3, relative to Group 1, participants with more severe baseline depressive symptoms, externalizing problems, and hopelessness were more likely to follow the Group 3 trajectory. Similarly, the same three predictors differentiated Group 2 from Group 1, with more severe scores predicting membership in Group 2 relative to Group 1. However, the only predictor that differentiated membership in

Group 3 relative to Group 2 was more severe hopelessness; the more severe hopelessness at baseline, the more likely adolescents were to follow the trajectory of Group 3.

*Logistic Regression Models:*

Suicide Attempt:

Overall, the latent trajectory group variable was a significant predictor of suicide attempts at follow-up ( $p=.01$ ), over and above multiple suicide attempt history and sex, demonstrating incremental validity ( $\chi^2 = 9.26, p=.01$ ). As shown in Table 3.4, relative to Group 1, Group 3 was associated with a four-fold increase in likelihood of a suicide attempt [(OR=4.15; CI=1.65, 10.44),  $p=.002$ ]. Adolescents in Group 3 were also approximately two times more likely to make a suicide attempt compared to adolescents in Group 2 (OR=2.29; CI=1.08, 4.85),  $p=.03$ . In contrast, adolescents in Group 2 were not more likely to make a suicide attempt relative to Group 1. The effect of trajectory group was not moderated by history of multiple suicide attempts. Due to a limited sample size of males in Group 3 with follow-up suicide attempt data, we did not have sufficient variability to fully examine if sex was a significant moderator.

Psychiatric Rehospitalization:

The latent trajectory group variable was also a significant predictor of psychiatric rehospitalization ( $p<.001$ ), over and above multiple suicide attempt history and sex, demonstrating incremental validity ( $\chi^2 = 38.69, p<.001$ ). Relative to Group 1, Group 3 was associated with an 11-fold increase in likelihood of being psychiatrically rehospitalized during the follow-up [(OR=11.20; CI=4.33, 29.01),  $p<.001$ ]. Adolescents in Group 3 were also approximately three times more likely to be rehospitalized compared to those in Group 2 [(OR=3.23; CI=1.37, 7.69),  $p<.008$ ]. Unlike what we observed for suicide attempts, adolescents in Group 2 were 3.5 times more likely to be rehospitalized relative to Group 1 [(OR=3.52;

CI=1.93, 6.40),  $p < .001$ ]. The effect of trajectory group was not moderated by multiple suicide attempt history. Again, due to limitations in sample size, we were not able to examine if sex was a moderator.

### **Discussion**

We examined a longitudinal course of suicidal ideation among suicidal adolescent inpatients followed for one year. We hypothesized that these adolescents would have different trajectories of suicidal ideation, as opposed to a single course of ideation that assumes change in the same direction across time as has been examined previously (Prinstein, et al., 2008). To the best of our knowledge, this is the first study that has examined distinct trajectories of suicidal ideation, and their impact on suicide attempts and rehospitalizations, in a sample of inpatient suicidal adolescents. Consistent with our expectations, the course of suicidal ideation post hospitalization was not uniform for all adolescents but was better represented by three distinct trajectories.

The most common trajectory was characterized by high suicidal ideation at the time of hospitalization, which rapidly declined below clinical levels within three months of hospitalization. The second most common trajectory was characterized by a course of elevated suicidal ideation at time of hospitalization, but at sub clinical levels, that also decreased during the follow-up, with the most striking decline again occurring within three months of hospitalization. This pattern of substantial decrease in suicidal thinking after hospitalization is consistent with other studies of adolescent inpatients showing a decrease in suicidal ideation shortly after hospitalization (King, et al., 2009; Prinstein, et al., 2008). However, one group of authors (Prinstein, et al., 2008) also reported a gradual reemergence of suicidal ideation between nine and eighteen months after hospitalization. Even though our study did not have an additional

assessment between months six and 12, the trend across the trajectory groups in our study indicates a pattern of relatively stable or decreasing ideation that did not increase at month 12 as might be expected based on previous results. The difference in the sample composition, wherein the current study focused on adolescents with a recent acute suicidal episode while the Prinstein et al.'s study also included non-suicidal inpatients, could be accounting for this discrepancy.

A key finding in our study was that a smaller, but significant, proportion of adolescents followed a trajectory characterized by persistent or chronic suicidal ideation. Adolescents in this group experienced similarly high levels of suicidal ideation at baseline as the youths following the fast declining trajectory, but their rate of decline was significantly slower. In fact, the severity of suicidal ideation characterizing the chronic group was significantly elevated through month six of the follow-up and was not far below clinical levels even 12 months after hospitalization. One possible pathway for persisting suicidal thoughts may be cognitive vulnerability characterized by hopelessness. High level of hopelessness was the only factor differentiating the chronic ideation group from the elevated but fast declining group. The idea that holding negative expectations about the future may be maintaining suicidal thoughts is also supported by a previous study of depressed psychiatric adult patients, where declines in hopelessness preceded declines in suicidal ideation (Sokero et al., 2006). It is also possible that enduring suicidal thoughts may be maintained by a related ruminative process that prolongs negative mood and impedes faster declines in suicidal thinking. Indeed, rumination, or tendency to repeatedly think about one's distress and associated circumstances, is associated with increases in suicidal ideation and also longer and more severe depressed mood (Smith & Alloy, 2009).



Adolescents in the chronic trajectory group were significantly more likely than teens in the other two groups to attempt suicide. In contrast, adolescents in the fast declining group were no more likely to attempt suicide than teens in the subclinical group. In addition, of significance is that trajectory group membership uniquely contributed to suicide attempts over and above a key risk factor, history of multiple suicide attempts, demonstrating incremental validity. An interesting question is whether prolonged suicidal thinking can habituate a person toward suicidal behavior, much like suicide attempts and other painful and fearsome experiences have been proposed to do by way of acquired capability for suicidal behavior, a key component of the Interpersonal-Psychological Theory of Suicidal Behavior (Joiner, 2005; Van Orden et al., 2010). Acquired capability for suicidal behavior is conceptualized by the theory as fearlessness about physical pain and death itself acquired through repeated risky behaviors or painful and provocative experiences (e.g., non-suicidal self-injury, abuse) that habituate a person toward self-injury and suicidal behavior. The theory proposes that acquired capability for suicide erodes the basic human instinct of self-preservation, thus making suicidal behavior more likely. It is possible that prolonged rehearsal of suicidal thoughts lowers the threshold for engaging in suicidal behavior via a similar process of habituation that produces acquired capability.

Adolescents in the chronic suicidal ideation group were also more likely to be psychiatrically rehospitalized during the follow-up relative to adolescents in the subclinical and the fast declining groups. In addition, when comparing the fast declining with the subclinical group, the former had greater odds of being psychiatrically rehospitalization. Although adolescents in the fast declining group were no more likely to attempt suicide than the subclinical group, they nevertheless experienced more severe suicidal ideation at baseline and throughout the follow-up, which might have rendered them more likely to experience psychiatric

crises requiring hospitalization. Unfortunately, we were unable to explore sex as a moderating variable for attempts and rehospitalizations due to the limited sample size of males in the chronic group. This question deserves more attention in future research. However, we found that the effect of trajectory group membership on suicide attempts or rehospitalization did not vary based on history of multiple suicide attempts. This finding highlights that all adolescents hospitalized for acute suicide risk with persisting suicidal thoughts are at high-risk for psychiatric crises regardless of previous suicide attempt history.

Finally, we explored which baseline risk and protective factors differentiated adolescents following the distinct trajectories. This information could contribute to identifying adolescents who might experience a more persistent course of suicidal ideation after hospitalization and who are more at risk for subsequent psychiatric crises. Almost all baseline factors considered were significant predictors in bivariate analyses. However, only depressive symptoms, externalizing problems, and hopelessness remained significant when all predictors were considered simultaneously. In general, higher scores on these predictors were associated with higher initial levels of ideation and more severe suicidal ideation trajectories. However, as already described, the only baseline predictor that differentiated the fast declining and chronic ideation groups was high level of hopelessness. One possible explanation for why some established risk factors in this study (e.g., social connectedness) did not predict trajectory group membership is the difficulty of distinguishing high-risk subgroups within an already high-risk population of suicidal adolescents, even based on well-documented risk factors (Yen et al., 2013). Moreover, according to the Interpersonal-Psychological Theory of Suicidal Behavior (Joiner, 2005; Van Orden et al., 2010), suicidal desire, which may manifest as suicidal ideation, arises from thwarted belongingness (e.g., low levels of social connectedness) and perceived burdensomeness.

As such, it is possible that social connectedness in combination with perceived burdensomeness might have had a greater impact on suicidal ideation trajectories.

*Implications:*

The present findings have important implications for identifying and intervening with adolescents most at risk for suicidal crises post hospitalization. Our findings suggest that suicidal ideation at the time of hospitalization may not be an adequate marker of suicide attempt risk and highlight the limitations of considering average changes in suicidal ideation; These approaches can overlook subgroups of suicidal adolescents who are most vulnerable to suicidal crises after hospitalization. The most common patterns of suicidal ideation are characterized by a decreasing trend in ideation, with the most significant decrease occurring within the first three months after hospitalization. This is consistent with average scores of suicidal ideation at each follow-up time point, showing a significant decline in ideation at three months and continuing to decrease thereafter, although less drastically. However, adolescents most likely to attempt suicide and be rehospitalized were similar to the most average group at hospitalization, but followed a distinct trajectory of persisting suicidal ideation, highlighting the importance of identifying and intervening with adolescents vulnerable to this pattern of ideation.

Our findings also have significant relevance for the critical need to closely monitor persisting suicidal ideation among recently discharged psychiatric inpatients as it may place these youths at an especially high risk for suicide attempts. In addition, the impact of prolonged suicidal ideation and associated suicidal crises may have negative effects on important developmental opportunities in the social, emotional, and cognitive domains that are critical to the adolescent developmental period. Our data suggests that one possible pathway for addressing these adolescents' vulnerability to persisting suicidal thinking is by way of reducing

their sense of hopelessness. It is also possible that persisting suicidal ideation and higher levels of hopelessness are indicative of an underlying cognitive vulnerability, such as tendency to ruminate, that ultimately renders these youths more at risk for suicidal behavior. More research considering mechanisms that maintain suicidal ideation is needed to inform how to improve these youths' post-hospitalization functioning.

It is noteworthy that the majority of adolescents who experienced a significant decrease in suicidal ideation within three months of hospitalization continued to report sub clinical levels of suicidal thoughts for the duration of the follow-up. Although the rapidly declining group had a lower risk of suicide attempts, they nevertheless were at risk for psychiatric rehospitalizations. It is possible that the presence of even less severe suicidal thinking following hospitalization places these youths at risk for future psychiatric crises warranting stabilization. As such, continued monitoring of all previously suicidal adolescents is recommended. In addition, our findings suggest that addressing key vulnerability factors that predict the course of suicidal ideation, particularly hopelessness, could shorten the duration of severe suicidal thoughts after hospitalization and thus may prevent continued suicidal crises. With relatively few longitudinal studies having examined hopelessness in psychiatrically hospitalized adolescents, more research attention is needed in this area.

*Study Limitations:*

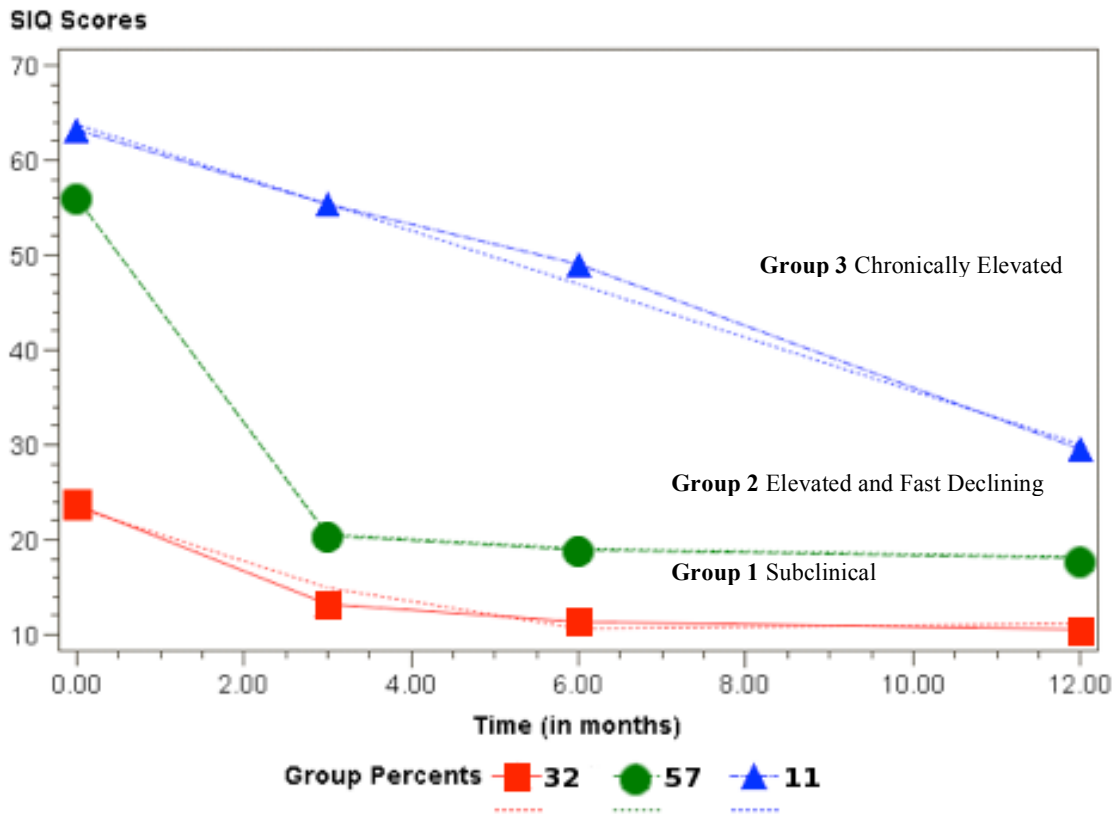
There are several important limitations of this study. The predominantly female and Caucasian sample from one region of the United States has limited generalizability to other adolescent groups. In addition, participants were psychiatrically hospitalized suicidal adolescents and findings may not apply to adolescents from outpatient clinics or from the community or to adolescents with high levels of suicidal ideation who were not hospitalized;

these adolescents might follow different trajectories or their distribution on the trajectories might be different than found in this study. However, due to the high-risk nature of this population and its vulnerability to suicidal crises, the study's focus on hospitalized suicidal adolescents is also its strength. Another limitation is that we did not examine additional potentially important predictors of trajectory groups. In particular, due to limited data, we were unable to fully examine sex as a predictor and we did not examine the influence of non-suicidal self-injury (NSSI). NSSI is an important correlate of suicidal behavior (e.g., Nock, Joiner, Gordon, Lloyd-Richardson, & Prinstein, 2006). Future studies should address this gap and explore additional predictors of suicidal ideation trajectories. More diverse adolescent samples should also be utilized in future work to explore the role of demographic variables such as age and race/ethnicity. The present study also has some measurement limitations: a) we used a brief screen to assess family psychiatric history that relied on one informant (usually the mother), did not assess diagnostic criteria, did not differentiate between different forms of mental illness, its timing or severity, or which parent had the mental illness; b) the measure of externalizing problems was based on youth self-report, which might have underestimated the extent of these problems. Finally, the degree to which subclinical suicidal ideation of the rapidly declining trajectory group might have been inflated at follow-up is uncertain. More specifically, one of the answer choices for the suicidal ideation measure, "I had this thought before but not in the past month," makes it difficult to assess the exact timing of suicidal ideation and whether or not it occurred between assessment time points (e.g. within last six weeks) or in more distant past. Despite these limitations, this study has addressed an important gap in the literature and has important strengths including a prospective design and a large sample of acutely suicidal adolescents.

Conclusion:

The majority of adolescents with elevated suicidal ideation at baseline experienced a significant decline in suicidal thoughts within three months after hospitalization; however, a significant proportion of youths continued to experience high levels of ideation throughout the entire follow-up. These teens were at the highest risk of attempting suicide and psychiatric rehospitalization, even when suicide attempt history was taken into account. Hopelessness emerged as a key predictor of persisting suicidal ideation, highlighting its potential role in facilitating declines in suicidal thinking post hospitalization. Results suggest that severity of suicidal ideation at the time of hospitalization may not be an adequate marker for subsequent suicidal crises. Instead, it may be important to identify adolescents who are vulnerable to persisting suicidal ideation, as they are at the highest risk for suicide attempts.

Figure 3.1 Latent trajectory classes



Note: SIQ=Suicidal Ideation Questionnaire

**Table 3.1** Suicidal ideation at baseline and follow-up

	Overall		Sex		Multiple Attempt Status		
	M (SD)	Females M (SD)	Males M (SD)	p <sup>a</sup>	No M (SD)	Yes M (SD)	p <sup>a</sup>
<b>Suicidal Ideation</b>							
baseline	(n=376) 46.53 (20.87)	(n=272) 47.64 (21.01)	(n=104) 43.63 (20.30)	<b>.09</b>	(n=226) 43.60 (20.84)	(n=150) 50.95 (20.19)	<b>.001</b>
3 months	(n=341) 22.28 (17.83)	(n=244) 24.44 (18.93)	(n=97) 16.84 (13.33)	<b>&lt;.001</b>	(n=205) 20.32 (16.73)	(n=136) 25.23 (19.07)	<b>.02</b>
6 months	(n=313 ) 20.09 (16.50)	(n=224) 21.55 (16.74)	(n=89) 16.40 (15.36)	<b>.01</b>	(n=191) 18.18 (14.98)	(n=122) 23.07 (18.30)	<b>.01</b>
12 months	(n=345) 17.06 (14.04)	(n=252) 18.02 (14.61)	(n=93) 14.46 (12.06)	<b>.02</b>	(n=214) 16.57 (13.61)	(n=131) 17.86 (14.74)	<b>.42</b>

Notes: <sup>a</sup>Two-sample t-test assuming unequal variances (two-sided)



**Table 3.2** Bivariate predictors of latent trajectory class membership

Variables	Group 1 relative to Group 2		Group 1 relative to Group 3		Group 2 relative to Group 3	
	B (SE)	p	B (SE)	p	B (SE)	p
Sex (male)	0.52 (0.31)	<b>0.01</b>	1.33 (0.54)	<b>0.01</b>	0.82 (0.54)	n.s.
Multiple attempters (yes)	-0.80 (0.30)	<b>0.01</b>	-1.28 (0.43)	<b>0.003</b>	-0.49 (0.41)	n.s.
Depressive symptoms	-0.08 (0.01)	< <b>0.001</b>	-0.10 (0.02)	< <b>0.001</b>	-0.02 (0.02)	n.s.
Externalizing problems	-0.09 (0.02)	< <b>0.001</b>	-0.08 (0.02)	<b>0.001</b>	0.01 (0.02)	n.s.
Hopelessness	-0.24 (0.05)	< <b>0.001</b>	-0.35 (0.06)	< <b>0.001</b>	-0.11 (0.04)	<b>0.01</b>
Substance abuse	-0.04 (0.02)	<b>0.01</b>	-0.01 (0.02)	n.s.	0.03 (0.02)	0.08
Physical abuse history (yes)	-0.21 (0.37)	n.s.	-0.11 (0.45)	<b>0.01</b>	-0.90 (0.42)	<b>0.03</b>
Sexual abuse history (yes)	-1.05 (0.40)	<b>0.01</b>	-0.88 (0.51)	0.09	0.18 (0.44)	n.s.

Notes: Group 1 = Subclinical ideators; Group 2 =Elevated but rapidly declining; Group 3 = Chronically elevated; Reference group in parantheses; Family connectedness, peer connectedness, and parental psychiatric history were not significant predictors of latent class membership

**Table 3.3** Predictors of latent trajectory class membership

<b>Latent SI Trajectory</b>	<b>Baseline Predictors</b>	<b>B</b>	<b>SE (B)</b>	<b>p</b>
(Group 1 as reference)				
<b>Group 2</b> (Elevated and Fast Declining)	Depressive symptoms	<b>0.06</b>	0.02	<b>&lt;.001</b>
	Externalizing problems	<b>0.08</b>	0.02	<b>&lt;.001</b>
	Hopelessness	<b>0.20</b>	0.04	<b>&lt;.001</b>
<b>Group 3</b> (Chronically Elevated)	Depressive symptoms	<b>0.07</b>	0.02	<b>&lt;.001</b>
	Externalizing problems	<b>0.07</b>	0.03	<b>.02</b>
	Hopelessness	<b>0.31</b>	0.06	<b>&lt;.001</b>
<b>Latent SI Trajectory</b>	<b>Baseline Predictors</b>	<b>B</b>	<b>SE (B)</b>	<b>p</b>
(Group 3 as reference)				
<b>Group 2</b> (Elevated and Fast Declining)	Depressive symptoms	-0.01	0.02	n.s
	Externalizing problems	0.02	0.02	n.s
	Hopelessness	<b>-0.11</b>	0.04	<b>.01</b>

Notes: SI=Suicidal ideation; N=370

**Table 3.4** Logistic regression predicting post-hospitalization suicide attempts and rehospitalization

Variables	Suicide Attempt <sup>a</sup>			Psychiatric Rehospitalization <sup>b</sup>		
	Odds ratio	CI (lower, upper)	p	Odds ratio	CI (lower, upper)	p
Sex (female)	0.85	(0.45, 1.61)	n.s	1.00	(0.57, 1.75)	n.s
Multiple Attempters (yes)	1.61	(0.91, 2.83)	n.s	1.37	(0.82, 2.29)	n.s
Latent SI Trajectories						
(Group 1)						
Group 2	1.81	(0.88, 3.74)	n.s	<b>3.52</b>	(1.93, 6.40)	<.001
Group 3	<b>4.15</b>	(1.65, 10.44)	<b>.002</b>	<b>11.20</b>	(4.33, 29.01)	<.001
(Group 2)						
Group 3	<b>2.29</b>	(1.08, 4.85)	<b>.03</b>	<b>3.23</b>	(1.37, 7.69)	<b>.008</b>

Notes: SI=Suicidal ideation; Reference group in parentheses; <sup>a</sup>N=350; <sup>b</sup>N=289

## **CHAPTER IV: Examining the Interpersonal-Psychological Theory of Suicidal Behavior in Psychiatrically Hospitalized Adolescents (Study 3)**

One integral part of suicide risk assessment involves considering risk and protective factors that are known correlates of suicidal behavior. Among the primary risk factors linked to adolescent suicidal behavior are a previous suicide attempt, suicidal ideation, non-suicidal self-injury (NSSI), depressive disorders, alcohol and drug misuse, disruptive behavior disorders and aggressive-impulsive behavior, and various social and interpersonal factors, such as low social support and abuse history (Andrews & Lewinsohn, 1992; Bridge et al., 2006; Borowsky et al., 2001; Hamza et al., 2012; King and Merchant, 2008; Lewinsohn, et al., 1996). While the presence of strong indicators of suicide risk could assist clinicians in suicide risk determination, individual risk factors may nevertheless not allow for sufficient confidence in predicting which adolescents are most likely to engage in suicide-related behaviors. That is, an individual risk factor is not necessarily associated with suicide-related behaviors for all youth. For instance, while 80 to 90% of adolescents who die by suicide suffer from a major mental illness (Brent et al., 1999; Gould et al., 2003; Shaffi et al., 1988), not all youth with a mental disorder engage in suicide-related behaviors. Similarly, not all youth experiencing suicidal ideation will go on to make a suicide attempt (Nock et al., 2013; King et al., 2014) and absence of suicide attempt history does not protect adolescents from post-hospitalization suicidal behavior (Goldston et al., 1999). Moreover, the majority of psychiatrically hospitalized adolescents and youth seeking psychiatric services in EDs often present with numerous risk factors, making accurate suicide risk determination particularly difficult. Suicide risk assessment measures or protocols should

ideally account for different risk and protective factors, and their relationship, to identify combinations of factors that are especially salient predictors of suicidal behavior—and what combination propels an already high-risk adolescent toward suicidal action.

A recent effort aimed at explaining and improving the prediction of suicidal is based on a theoretical model—the Interpersonal-Psychological Theory of Suicidal Behavior (IPTS; Joiner, 2005; Van Orden et al., 2010). This theory proposes that suicidal behavior (i.e. suicide attempts and death by suicide) takes place when an individual has both the desire for death—influenced by thwarted belongingness and perceived burdensomeness—and an acquired capability to enact lethal self-injury. Thwarted belongingness involves a perception that one is alienated from others while perceived burdensomeness is the perception that one is a burden on others. Acquired capability for suicide, on the other hand, is conceptualized as fearlessness about physical pain and death itself, which can be acquired through risky behaviors or painful and fear-provoking experiences (e.g., abuse, non-suicidal self-injury, previous suicide attempt) that habituate a person toward suicidal action and erode the basic human instinct of self-preservation. The theory states that an individual will engage in suicidal behavior only when the desire for death—or the sense of burdensomeness with thwarted belonging—is coupled with acquired capability. Please see Figure 4.1 for an illustration of the IPTS theory.

The theory purports that these components help explain why individual risk factors sometimes produce suicidal thoughts or behaviors and sometimes do not. Individual risk factors are hypothesized by IPTS to confer risk for suicidal thoughts and behaviors when they involve feelings of thwarted belongingness and perceived burdensomeness and pain or provocation that results in acquired capability for suicide (Van Orden et al., 2010). In other words, IPTS proposes that these three components serve as a common proximal pathway from risk factors to suicidal

ideation and suicidal behavior. Evaluating the presence of these three components, conceptualized as a proximal pathway to suicidal behavior, rather than the many predictors of adolescent suicide, conceptualized as being more distal, in order to determine the degree of an individual teen's risk could offer a more clinically useful assessment framework (Van Orden et al., 2010). It is important to note that, while the theory offers a more proximal and specific framework for suicide risk assessment, it is not meant to substitute for an evaluation of additional and more acute risk factors such as severe hopelessness, agitation, insomnia, or other sleep disturbance, among others. It has been proposed, however, that incorporating IPTS theory into assessment of these more imminent risk indicators might increase the accuracy of identifying individuals at immediate suicide risk (Ribeiro, Bodell, Hames, Hagan, & Joiner, 2013).

To date, few studies have examined IPTS while considering all three components simultaneously, with most studies having focused on only one or two components (e.g., Joiner et al., 2002; Van Orden, Lynam, Hollar, & Joiner, 2006; Van Orden, Witte, Gordon, Bender, & Joiner, 2008). In addition, little is known about the developmental appropriateness of the theory in explaining adolescent suicidal behavior. In the first study examining all components of IPTS, Joiner and colleagues (2009) demonstrated that the interaction between low belongingness, perceived burdensomeness, and acquired capability for suicide, measured by lifetime number of suicide attempts, was associated with recent suicide attempts in a clinical sample of suicidal young adults. Similarly, in a recently published study of US National Guard personnel, the interaction of the three theory components was associated with lifetime suicide attempts (Anestis, Khazem, Mohn, & Green, 2015). However, two additional studies have not found support for the three components being essential in explaining suicidal behavior. Specifically, the three-way interaction between all three constructs was not associated with suicidal history (a

composite index of previous suicide attempts, frequency of suicidal ideation, previous suicidal communication, and subjective likelihood of future attempts) in a military sample of active duty Airmen (Bryan, Morrow, Anestis, & Joiner, 2010). While it is possible that this lack of support for the theory might have been influenced by the composite measure of suicidal history not sufficiently capturing suicidal behavior, a more recent study of veterans entering inpatient psychiatric treatment revealed similar findings. In this study, the interaction between belongingness, burdensomeness, and acquired capability did not differentiate veterans with and without history of previous suicide attempts (Montheith, Deleene, Menefee, Pettit, Leopoulos, & Vincent, 2013). While methodological differences (e.g., different samples; examining recent versus lifetime suicide attempts) might have accounted for discrepant findings, additional studies are needed to clarify the relationship between IPTS components and address the methodological limitations of previous research.

A key limitation of existing studies is their retrospective and cross-sectional design. These limitations preclude establishing a temporal relationship between IPTS components and suicidal behavior. A prospective study of IPTS would allow for a stronger test of the theory. Moreover, the majority of existing studies examining at least two components of IPTS have focused on adult, college, and military populations. Little is known about the applicability of the theory to an at-risk adolescent population. This is an important limitation given that the components of the theory may have differential effects on suicide risk for some developmental periods. Indeed, a community-based study of adults in their 20s, 40s, and 60s demonstrated that the interaction between burdensomeness and thwarted belonging was associated with increasing suicidal ideation for those in their 20s and 60s, whereas an inverse relationship was observed for those in their 40s (Christensen, Batterham, Soubelet, & Mackinnon, 2013). Though the study did

not examine if the differences across age groups were statistically significant, and replication is needed before strong conclusions can be drawn, its findings call attention to the importance of examining the relative relevance of the theory in different age groups.

It is worth noting that previous studies –although not testing IPTS directly—have provided some initial support for the relevance of the theory to adolescents. In particular, greater sense of connectedness to others has been consistently linked to a decreased likelihood of youth suicide attempts and suicidal ideation (Borowsky et al., 2001; Borowsky, Resnick, Ireland, & Blum, 1999; Czyz et al., 2012; Eisenberg & Resnick, 2006; Resnick et al., 1997). Less is known about the role of burdensomeness and adolescent suicide risk. One study (Woznica & Shapiro, 1990) examined a construct that is similar to perceived burdensomeness—the “expendable child” syndrome originally proposed by Sabbath (1969). Specifically, these authors found that higher scores on a psychotherapist-rated scale of expendability, or a sense of being unwanted and/or a burden on their families, differentiated adolescents with suicidal ideation or history of attempts from other adolescents (Woznica and Shapiro, 1990). Lastly, providing first evidence about the applicability of IPTS to an adolescent population, Opperman and colleagues reported that low sense of belongingness with family combined with high perceived burdensomeness was associated with suicidal ideation among adolescents recruited from an emergency department (Opperman, Czyz, Gipson, & King, 2015). We are building on this and other existing work by testing all three IPTS components using a prospective design in a sample of acutely suicidal adolescents.

### *Study Purpose*

The purpose of this study is to fill important gaps in existing research by examining how well IPTS can prospectively explain suicidal behavior in a psychiatric sample of suicidal



adolescents. A promising implication of studying the applicability of IPTS is a more parsimonious risk assessment framework. Specifically, as described, these teens frequently have numerous risk factors, which makes risk prediction especially difficult, while IPTS proposes a more proximal pathway from risk factors to suicidal behavior whereby individual risk factors are hypothesized to confer risk when they involve, or increase likelihood that individuals will experience, feelings of thwarted belongingness and perceived burdensomeness, and which are accompanied by acquired capability (Van Orden et al., 2010). In addition, examining the IPTS model in this sample could lead to the development of valuable intervention approaches with suicidal adolescents. As part of this study purpose, the following questions will be examined:

1. Does the IPTS model predict future suicide attempts among psychiatrically hospitalized suicidal adolescents? In line with the model, we hypothesized that the simultaneous presence of low sense of belonging, high perceived burdensomeness, and high acquired capability for self-injury would be associated with proximal risk of suicide attempts within three months of hospitalization and more distal risk within 12 months, while accounting for important correlates of suicidal behavior, such as depressive symptoms (Nock et al., 2013; Schafer et al., 1996). We expected that the likelihood of suicide attempts would be greater in the presence of an interaction between suicidal desire (i.e. burdensomeness combined with thwarted belongingness) and acquired capability (i.e. lifetime multiple suicide attempts, conceptualized by the theory as strongly impacting acquired capability for suicide) than either component alone.

2. We examined sex as a moderator of these relationships in light of the marked sex differences in suicidal behavior, with females being more likely to attempt suicide and males being more likely to die by suicide (CDC, 2012). The need to consider potential sex differences is particularly warranted in view of previous studies demonstrating sex-specific association

between interpersonal factors such as social support—a construct similar to belongingness—and suicide-related outcomes, where significant associations were observed for female, but not male, adolescents (Kerr, Preuss, & King, 2006; Lewinsohn et al., 2001; Mazza, & Reynolds, 1998). To the best of our knowledge, sex differences have not been examined in previous research of IPTS, an important gap that could help inform for whom the theory might have the most, or least, potential to be useful in guiding risk assessment of future suicidal behavior.

## **Methods**

### *Participants:*

Participants were 376 adolescents who had been psychiatrically hospitalized due to acute suicidal ideation or attempt and were subsequently followed for one year. As in Study 2 described above, the sample was drawn from the same randomized clinical trial of a social support intervention—Youth-Nominated Support Team-II (YST-II)—for suicidal adolescents following hospitalization (King et al., 2009). Inclusion and exclusion criteria, in addition to study procedures, are described in Study 2. Adolescents were included in the present study if they had completed at least one follow-up assessment three, six, or 12 months after hospitalization and for whom we had complete follow-up data on suicide attempts within three months and, for another set of analyses, within 12 months after hospitalization. There were no statistically significant differences between those with and without follow-up data based on key demographic characteristics, relevant clinical characteristics, or variables of interest.

Similarly to Study 2, participants included in this study were predominantly female (72%) with a mean age of 15.59 years (SD=1.31). The racial/ethnic composition of the sample was approximately 83% Caucasian, 7% African-American, 0.5% Asian-American/Pacific

Islander, 2% Hispanic, 0.5% Native American, and 7% “Other” or not identified. The annual income of adolescents’ families ranged from less than \$15,000 to more than \$100,000, with the median annual family income between \$40,000 and \$59,000. Further, 10% of participants lived in families where at least one parent received public assistance.

*Measures:*

Acquired Capability and Suicide Attempt Outcome: Lifetime multiple attempt status, assessed at baseline, and suicide attempts at each of the follow-up points were assessed with the Diagnostic Interview Schedule for Children (DISC–IV) (Shaffer, Fisher, Lucas, & NIMH DISC Editorial Board, 1998). The presence of suicide attempts was assessed with the question “Have you ever, in your whole life, tried to kill yourself or made a suicide attempt?” (yes/no). The time frame was adapted to capture the appropriate assessment window at each follow-up assessment. Baseline history of multiple suicide attempts was used as a measure of acquired capability, as an established measure of acquired capability (i.e. Acquired Capability for Suicide Scale; Van Orden et al., 2008) was not available. Though suicide attempt history is just one measure of acquired capability, it is perhaps the most relevant source of acquired capability, particularly in a suicidal clinical sample. Aside from being at an increased risk for subsequent suicidal behavior (Goldston et al., 1999; Hulten et al., 2001), multiple suicide attempters are also more prone to other experiences that are indicative of and lead to high acquired capability for suicide, such as higher engagement in non-suicidal self-injury, violence, hard drug use, and being sexually or physically assaulted (Esposito, Spirito, Boergers, & Donaldson, 2003; Rosenberg, Jankowski, Sengupta, Wolfe, Wolford, & Rosenberg, 2005). Moreover, adolescents with multiple suicide attempts may also be at higher risk for lethal attempts as they more often timed their attempts so that intervention was not possible, more often reported wanting to die from their attempt, and

more frequently reported regretting recovery (Miranda, Scott, Hicks, Wilcox, Munfakh, & Shaffer, 2008). In addition, multiple suicide attempts was used as a measure of acquired capability in a previous study of IPTS (Joiner et al., 2009), which allows for a more direct comparison of findings across studies.

Perceived Burdensomeness: Perceived burdensomeness was measured with three items from the *Suicidal Ideation Questionnaire-Junior* (SIQ-JR) (Reynolds, 1988), which is a 15-item self-report questionnaire that measures frequency of a range of suicidal thoughts. The SIQ-JR has solid, well-documented psychometric properties (Reynolds, 1988, 1992) and has been found to predict suicidal thoughts and attempts six months after psychiatric hospitalization in a sample of adolescents (King, Hovey, Brand, & Ghaziuddin, 1997). The three items include: ““I thought that others would be happier if I was dead;” “I wished that I had never been born;” and “I thought that no one cared if I lived or died.” Items are rated on a 7-point scale ranging from “I never had this thought” to “almost every day.” A factor analysis of the SIQ-JR based on data from two studies of inpatient adolescents (King, Woolley, Kerr, & Vinokur, unpublished manuscript) revealed that SIQ-JR has three factors, one of which (Interpersonal factor) included these three items. As evidence of convergent validity, the three items correlated adequately (.59,  $p < .001$ ) with six items assessing the construct of burdensomeness from the Interpersonal Needs Questionnaire (INQ) (Van Orden et al., 2012) in a sample of 139 12–15 year-olds who were recruited from a medical emergency department for participation in a larger CDC-funded intervention effectiveness trial, Links to Enhancing Teens’ Connectedness led by C.A. King. Internal consistency for the three items in this sample was .81.

Thwarted Belongingness: Thwarted belongingness was measured with items from the *Perceived Emotional/Personal Support Scale* (PEPPS) (Slavin, 1991), which has been used to

measure a related construct of connectedness (Czyz et al., 2012). PEPPS assesses the degree to which respondents perceive their relationships as close, confiding, satisfying, and supportive within the domains of family, friends, and non-family adults. Participants listed initials of up to three people in the each domain and, using a four-point scale ranging from “hardly at all” to “very much, rated how close they feel to each person, how satisfied they are with the help and support the person gives them, and how much they talk to each person about personal concerns. PEPPS demonstrated reasonably high test-retest reliability and internal consistency in an adolescent sample (Slavin, 1991). We focus on family belongingness because of its well-documented relationship with youth suicide attempts and suicidal ideation (e.g., Borowsky et al., 1999, 2001; Resnick et al., 1997) and because family involvement plays a key role in positive intervention effects with suicidal adolescents (Diamond et al., 2010; Esposito-Smythers, Spirito, Kahler, Hunt, & Monti, 2011; Pineda & Dadds, 2013), thus having most relevance in the context of this study. Each of the components/subscales of family belongingness (closeness, support, confiding) was averaged and used as an index of the thwarted belongingness latent variable. Scores were reverse-coded to reflect thwarted belongingness.

Depressive Symptoms: The *Children’s Depression Rating Scale-Revised* (CDRS-R) (Poznanski & Mokros, 1996) was used to measure depressive symptoms within the previous two weeks. The CDRS-R is a semi-structured interview that assesses a broad range of depressive symptoms grouped into 17 areas, such as Appetite Disturbance, Sleep Disturbance, Social Withdrawal, or Depressed Feelings. Items are rated on a 5- or a 7-point scale and scores range from 17 to 113. The measure has strong psychometric properties in studies with adolescents (e.g., Emslie et al., 1997; Shain, Naylor, & Alessi, 1990). Inter-interviewer reliability for total scores, assessed prior to data collection, was high (mean alpha across raters of .98).

### *Data Analysis:*

Structural equation modeling (SEM) was used to examine two IPT models predicting suicide attempts within three and 12 months after hospitalization. Analyses were conducted using Mplus, version 6.1. The models included two latent variables (thwarted belongingness and perceived burdensomeness, with three indicators each) and an observed acquired capability variable measured by lifetime multiple attempts (yes/no). Confirmatory factor analysis was first conducted to determine if the selected thwarted belongingness and perceived burdensomeness indicators adequately represented these latent variables (measurement model described in results). Next, SEM was used to examine relationships between the latent and measured variables. Main effects of thwarted belongingness, perceived burdensomeness, and acquired capability on the suicide outcome were examined first. Two-way interactions between these variables were considered next. The three-way interaction between thwarted belongingness, perceived burdensomeness, and acquired capability was examined as the last step. In addition, multi-group analyses were conducted to examine whether these relationships varied depending on sex, and Wald tests of parameter equality constraints were used to examine the significance of any sex differences. All analyses controlled for baseline depressive symptoms. In addition, given that the original sample came from an intervention study, intervention group was included as a covariate; however, as it was not a significant predictor and results did not vary with it in the models, it was removed from the final models.

## **Results**

### *Characteristics of the Sample:*

Prior to baseline, 91 (24%) of adolescents had not attempted suicide, 135 (36%) had made one attempt, and 150 (40%) had a history of two or more attempts. Sex did not differentiate baseline multiple suicide attempters from non-multiple attempters. Twenty-eight

adolescents, or approximately 7% of the sample, made at least one suicide attempt at the three-month follow-up, and 64, or 17% of the sample, made at least one suicide attempt during the one-year follow-up. Adolescents with multiple attempt histories were more likely to attempt suicide (24% vs. 14%),  $\chi^2(1, N=355)=4.81, p=.03$  prior to 12-months, but not prior to three months after hospitalization. Sex did not differentiate suicide attempters from non-attempters during the follow-up. Table 4.1 includes the correlations among all study measures.

*Measurement Model:*

The results of the confirmatory factor analysis showed good model fit based on Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI) of 0.99 each, and the Root-Mean Squared-Error (RMSEA) of 0.02 (90% CI=0.001, 0.07). In general, CFI and TLI values of above 0.90 and RMSEA values of 0.05 to as high as 0.08 indicate good model fit to the data (Byrne, 2012). The standardized factor loadings for the perceived burdensomeness latent variable were high (0.84, 0.68, 0.80;  $p < .001$ ), as were loadings for the thwarted belongingness variable (0.88, 0.79, 0.68;  $p < .001$ ), indicating that the selected items captured the two latent variables.

*Predicting Suicide Attempts using Structural Equation Models:*

Suicide attempts three months after hospitalization

The interaction between thwarted belongingness, perceived burdensomeness, and acquired capability did not significantly predict suicide attempts three months after hospitalization (Table 4.2). The interaction between thwarted belongingness and perceived burdensomeness was also not significant. Similarly, neither thwarted belongingness, perceived burdensomeness, nor acquired capability, when examined as main effects, predicted suicide

attempts within three months of hospitalization. However, the model yielded two significant two-way interaction effects, which were moderated by sex.

First, the interaction between thwarted belongingness and acquired capability had overall significance for the entire sample ( $B=0.85$ ,  $p=.04$ ), where adolescents with low acquired capability (i.e. non multiple suicide attempters) and higher levels of thwarted belongingness were more likely to attempt suicide ( $B=0.78$ ; [OR=2.18, 95% CI=1.10, 4.33];  $p=.02$ ) when compared to those with high acquired capability (i.e. multiple suicide attempters) ( $B=-0.07$ ; [OR=0.93, 95% CI= 0.63, 1.38];  $p=.73$ ). Examination of sex differences revealed that the interaction between low acquired capability and higher levels of thwarted belongingness was significant for girls ( $B=1.22$ ,  $p=.02$ ), but not boys ( $B= -0.22$ ,  $p=.71$ ), suggesting that this relationship was mostly influenced by, and more salient for, girls. However, it is important to note that the group moderation effect did not reach significance ( $t=3.24$ ,  $p=.07$ ).

Second, there was a significant interaction between perceived burdensomeness and acquired capability, but only when moderated by sex ( $t=7.43$ ,  $p=.006$ ); this interaction was not significant for the overall sample ( $-0.48$ ,  $p=.28$ ). Specifically, the interaction between acquired capability and perceived burdensomeness was significant for boys ( $B= -2.66$ ,  $p=.007$ ), but not girls ( $B=0.36$ ,  $p=.49$ ). An exploration of this interaction showed that, relative to boys with high acquired capability, boys with low acquired capability and higher levels of perceived burdensomeness were less likely to attempt suicide three months post hospitalization ( $B= -1.38$ , [OR=0.25, 95% CI = 0.73, 0.86];  $p=.03$ ). A graphic summary of the relationship between IPTS components and the attempt outcome three months after hospitalization is provided in Figure 4.2.

Suicide attempts within 12 months after hospitalization



The interaction between thwarted belongingness, perceived burdensomeness, and acquired capability also did not predict suicide attempts 12 months after hospitalization (Table 4.3). Similarly, neither thwarted belongingness nor perceived burdensomeness, when examined as main effects, predicted suicide attempts 12 months after hospitalization. In addition, and unlike observed for suicide attempts within three months, there were no significant 2-way interactions. The only significant predictor of suicide attempts during the 12-month period was acquired capability, where adolescents with high acquired capability were more likely to attempt suicide ( $B= 0.32$ , [OR=1.38, 95% CI = 1.01, 1.88];  $p=.04$ ), even after controlling for important covariates. This significant main effect was not moderated by sex ( $t=0.19$ ,  $p=.66$ ).

*Supplemental Analyses with Peer Thwarted Belongingness:*

As mentioned in the methods section, the focus of this study, in examining the relevance of IPTS to adolescents, was on the construct of thwarted belongingness within the family. However, because the results only partially supported the theory, we reran all the analyses with peer thwarted belongingness (Note: the peer thwarted belongingness latent variable was also based on the three belongingness indexes derived from the PEPPS (Slavin, 1991)). The analytic approach was the same as described above. The measurement model with peer thwarted belongingness indicated a good model fit (CFI=0.99; TLI=0.99; RMSEA=0.03 [90% CI=0.001, 0.07]). The standardized factor loadings for the peer thwarted belongingness variable were high (0.86, 0.81, 0.76;  $p < .001$ ), indicating that the selected items captured the latent variable. The pattern of these supplemental results was similar to the results reported for family thwarted belongingness. Specifically, the three-way interaction between peer thwarted belongingness, perceived burdensomeness, and acquired capability did not significantly predict suicide attempts three or 12 months after hospitalization. In addition, the model predicting suicide attempts at

three months yielded a similar pattern of two-way interactions moderated by sex. The interaction between perceived burdensomeness and acquired capability was again moderated by sex ( $t=9.90$ ,  $p=.002$ ), indicating that this interaction was significant only for boys ( $B= -2.25$ ,  $p=.002$ ); boys with low acquired capability and higher levels of perceived burdensomeness were less likely to attempt suicide three months post hospitalization ( $B=-1.38$ ,  $p=.03$ ) while an opposite pattern was found for boys with high acquired capability and higher levels of perceived burdensomeness. The thwarted belongingness by acquired capability interaction was moderated by sex ( $t=3.91$ ,  $p < .05$ ), whereby girls with low acquired capability and higher levels of peer thwarted belongingness were more likely to attempt suicide at three months ( $B=0.56$ ,  $p=.06$ ); however, this finding did not reach statistical significance. As was the case in the analysis involving family thwarted belongingness, only high acquired capability was associated with 12-month suicide attempts ( $B= 0.29$ ,  $p=.04$ ).

### **Discussion**

Seeking to fill important gaps in the literature, this study examined how well the Interpersonal Psychological Theory of Suicidal Behavior (ITPS) predicts suicide attempts in a large sample of psychiatrically hospitalized suicidal adolescent within three and 12 months after hospitalization, and whether or not the relationship between the theory's components and suicide attempts varied by sex. To our knowledge, this is the first study to test IPTS prospectively, to include a high-risk sample of suicidal adolescents, and to consider sex as a moderator. Our findings offer partial support for the theory among suicidal adolescents and highlight the importance of considering sex differences in applying the theory to suicidal behavior.

A primary finding was that, contrary to the hypothesis, the interaction between thwarted belongingness, perceived burdensomeness, and acquired capability did not predict suicide

attempts in the more immediate risk period of three months or the more distal period of 12 months after hospitalization. Although surprising and contrary to the theory, this finding is consistent with two retrospective studies of military populations (Bryan et al., 2010; Monteith et al., 2013), neither of which found support for the three components being essential in explaining previous suicide attempts or suicidal history. Thus far, two studies demonstrated that the simultaneous presence of all three components was associated with suicidal behavior (recent suicide attempts, lifetime attempts) (Anestis et al., 2015; Joiner et al., 2009). Together with the two previous studies (Bryan et al., 2010; Monteith et al., 2013), our findings raise questions about the relative importance of, and necessity for, the three IPTS constructs in explaining suicidal behavior, and underscore the need for additional prospective research of IPTS to further clarify the discrepancies between theory and research. In particular, because our study relied on proxy measures of theory constructs (e.g. multiple attempt history as an indicator of high acquired capability), studies using established measures of theory constructs are needed to provide more confidence in the findings.

Another key finding in our study concerns sex-specific associations between the different theory components and suicide attempt risk. Boys with low acquired capability and higher levels of perceived burdensomeness were at lower risk of suicide attempts within three months of hospitalization compared to boys with high acquired capability; this effect did not hold for girls. It is notable that previous studies have similarly reported an interaction between acquired capability and perceived burdensomeness in the absence of a significant interaction between all three components (Bryan et al., 2010; Monteith et al., 2013). The replication of this pattern of findings in an adolescent population suggests that the role of perceived burdensomeness in the presence of acquired capability constitutes a clinically significant combination in high-risk

populations. However, our study is the first to show that this relationship varies depending on sex. The finding that burdensomeness combined with acquired capability predicted suicide attempts among boys, but not girls, is noteworthy because of the difficulty in identifying clinically valuable risk factors for suicidal behavior among high-risk adolescent males (King et al., 2013).

While more research is needed to better understand the mechanisms accounting for this finding, one possible reason for the significant interaction among suicidal adolescent boys, but not girls, may be due to these boys' greater reactivity to feelings of burdensomeness, which might have been exacerbated by the recent hospitalization. In a recent study of hospitalized adolescents, experiences of heightened negative affect sensitivity or reactivity were more strongly associated with elevated suicidal ideation for males (Selby, Yen, & Spirito, 2013). It is thus possible that the males in this sample experienced a lower threshold for suicidal action in response to an emotional trigger such as feelings of burdensomeness. The fact that this vulnerability was observed among boys with multiple suicide attempt history is also consistent with previous research showing that adolescents with multiple suicide attempt history have higher levels of affect dysregulation (Esposito et al., 2003). Another possible explanation might have to do with gender differences in attitudes toward the self. A recent study found that, among men but not women, depressive symptoms conferred elevated risk for suicide in the presence of higher value placed on autonomy (Bamonti, Price, & Fiske, 2014). Although attitudes toward autonomy were not assessed in our study, adolescence is a transitional period in which sense of autonomy is developing. The sense of perceived burdensomeness may capture similar constructs that are potentially more salient for males than females. This study provides initial evidence that

burdensomeness feelings may warrant particular attention among adolescent males, although additional studies are needed to replicate and more fully understand its significance.

The second sex-specific association found in the study was between thwarted belongingness and acquired capability. Although *low* acquired capability accompanied by higher levels of thwarted belongingness was associated with an overall suicide attempt risk within three months of hospitalization, this relationship appeared to be mostly influenced by girls. However, some caution is warranted in interpreting this finding due to the group moderation effect not reaching statistical significance. It is important to note that we may have been insufficiently powered to detect significant, particularly more modest, effects with our modeling approach (MacCallum, Browne, & Sugawara, 1996). Nevertheless, the interaction between low acquired and higher levels of thwarted belongingness had a significant robust effect among girls and was non-significant for boys, suggesting that the overall interaction effect was largely driven by girls. This is consistent with previous studies showing that family support is more salient for girls in predicting less severe suicide-related outcomes, including suicidal ideation and attempts (Kerr et al., 2006; Lewinsohn et al., 2001). On the other hand, others have also shown that the protective effect of family connectedness extends to both male and female adolescents (Ackard et al., 2006; Borowsky et al., 2001; Eisenberg & Resnick, 2006). Future research is needed to add to our understanding of gender differences in IPTS.

Some attention is warranted to the fact that the interaction between acquired capability and thwarted belongingness had an opposite than expected effect on post-hospitalization suicide attempt risk. A possible explanation for this finding might be related to the way we measured acquired capability and the dynamic nature of thwarted belongingness within high-risk families across time. Our previous work has shown that adolescents low in acquired capability (single and

non-attempters) experienced greater sense of belongingness with family three months after hospitalization relative to the high acquired capability group (multiple attempters), even though both groups reported similar levels of belongingness with family at hospitalizations (Cyz et al., 2013). This indicates greater variability in thwarted belongingness for adolescents with low acquired capability during the three-month period and a potential floor effect among adolescents with high acquired capability. In this context, our findings indicating that thwarted belongingness is a risk factor for those with low acquired capability—or that decreasing thwarted belongingness may be protective in this group—seem more conceivable, though inconsistent with IPTS.

However, it is worth noting that the unexpected interaction effect was previously reported in a study of veterans entering inpatient psychiatric treatment (Montheith et al., 2013), suggesting that methodology alone is unlikely to explain the contradictory findings. In the Montheith and colleagues' study, higher levels of thwarted belongingness was associated with lower likelihood of previous multiple suicide attempts among veterans with low acquired capability, while high acquired capability accompanied by greater thwarted belongingness was not associated with multiple attempt history (L. Montheith, personal communication, October 28, 2013). Moreover, in yet another military study, the interaction between thwarted belongingness and acquired capability was not significantly associated with suicidal history (Bryan, et al., 2010). While the explicit focus of IPTS is on the simultaneous effect of all its three components, the fact that the combined effect of thwarted belongingness and high acquired capability does not appear to impact risk of suicidal behavior in this and other studies is of significance. Firstly, it could explain why the interaction between all three components was not supported, beyond any methodological differences across studies. Secondly, it invites consideration of perceived burdensomeness in combination with acquired capability as the more prominent components of

the theory.

Finally, our study points to time-varying impact of IPTS components on suicide attempt risk after psychiatric hospitalization. Specifically, perceived burdensomeness combined with acquired capability was associated with suicide attempts within the first three months of hospitalization, but no longer impacted risk of suicide attempts within the entire 12-month follow-up. A similar time-limited effect was observed for thwarted belongingness in the presence of acquired capability. The only significant predictor of suicide attempt within 12 months of hospitalization was high acquired capability. Together, this pattern of findings suggest that thwarted belongingness and perceived burdensomeness are more dynamic (Van Orden et al., 2010) and represent more state-dependent influence on suicide risk. By the same token, these factors might be modifiable in high-risk populations, and thus could be of value in development of intervention approaches for suicidal adolescents. In fact, there is emerging evidence for the value of increasing inpatient adolescents' sense of connectedness shortly after hospitalization to improve suicide-related outcomes, including suicidal ideation, depressive symptoms, and suicide attempts (Czyz et al., 2012). The fact that multiple suicide attempt history had the most lasting effect on suicide attempt risk is consistent with acquired capability being conceptualized as the static component of IPTS (Van Orden et al., 2010), and is in line with previous research demonstrating its strong association with future suicidal behavior (Goldston et al., 1999; Hulten et al., 2001). This underscores the importance of prevention of the onset and maintenance of behaviors and experiences that increase acquired capability (e.g., initiation of suicidal behavior, transition from one-time to multiple attempt status).

Study Limitations:

This study has several important limitations. The generalizability of our findings is limited by largely female and Caucasian sample from one region of the United States. In addition, because participants were psychiatrically hospitalized due to a suicide risk concern, the range of the variables might be reduced and also findings may not apply to adolescents from outpatient clinics or from the community. However, the study's focus on hospitalized suicidal adolescents who are particularly vulnerable to suicidal crises is also its strength. The study also has measurement limitations related to our use of proxy measures for some of the theory constructs. Specifically, while our use of multiple suicide attempts represents one of the strongest indicators of acquired capability and is theoretically sound (due to its association with subsequent suicidal behavior and other indicators of acquired capability such as non-suicidal self-injury, violence, hard drug use, sexual and physical assault), the strength of our conclusions is tempered by these measurement limitations. Future work would be strengthened by use of measures specifically designed to assess IPTS constructs (e.g., Van Orden et al., 2008) and by consideration of various indicators of acquired capability (e.g., non-suicidal self-injury, abuse history, physical injuries). For example, this might help solidify if the results are influenced by the underlying construct of acquired capability as conceptualized by the theory (high pain tolerance, fearlessness about death itself) rather than another construct associated with multiple suicide attempts (e.g., emotion dysregulation; Esposito et al., 2003). However, it is noteworthy that the results of this study are consistent with a previous study that utilized the measures specifically established to measure IPTS (Montheith et al., 2013), thus providing some confidence in our results not being an artifact of construct measurement. In addition, the pattern of results was similar when we examined thwarted belongingness in the context of family and, in supplemental analysis, peer relationships. Despite these limitations, this study has important



strengths including a large sample of acutely suicidal adolescents and a prospective design that allowed for a stronger test of IPTS.

*Implications and Conclusions:*

The current study has important implications for intervening with suicidal adolescents at risk for suicide attempts after hospitalization. It is noteworthy that thwarted belongingness, perceived burdensomeness, and depressive symptoms were not independently associated with suicide attempts; only acquired capability predicted suicide attempts, but not within the first three months of hospitalization. In contrast, the combined effect of these predictors proved to be more robust in differentiating suicide attempters from non-attempters, particularly in the critical period shortly after hospitalization. The importance of considering the synergistic effect of multiple risk factors is consistent with IPTS and might be especially relevant for assessment and intervention with high-risk adolescent groups. In particular, asking adolescent boys about thoughts of feeling like a burden on others, especially if they report acquired capability for suicidal behavior, could help identify those at highest risk for subsequent suicidal behavior. Assessing thoughts of burdensomeness among adolescent males has added value in view of the fact that identifying high-risk boys is difficult, even when incorporating known risk factors such as suicidal ideation (King et al., 2013). Our findings also indicate that improving hospitalized adolescents', particularly girls', sense of belongingness might also reduce risk of suicidal behavior shortly after hospitalization; however, this benefit appears to extend to those with low acquired capability for suicidal behavior, which also highlights the need to strengthen belongingness among adolescents with multiple suicide attempt histories whose social support systems might be considerably weaker (Cohen-Sandler, Berman, & King, 1982; Kotila & Lonqvist, 1987). Our findings also reveal that it is critical to provide ongoing suicide risk

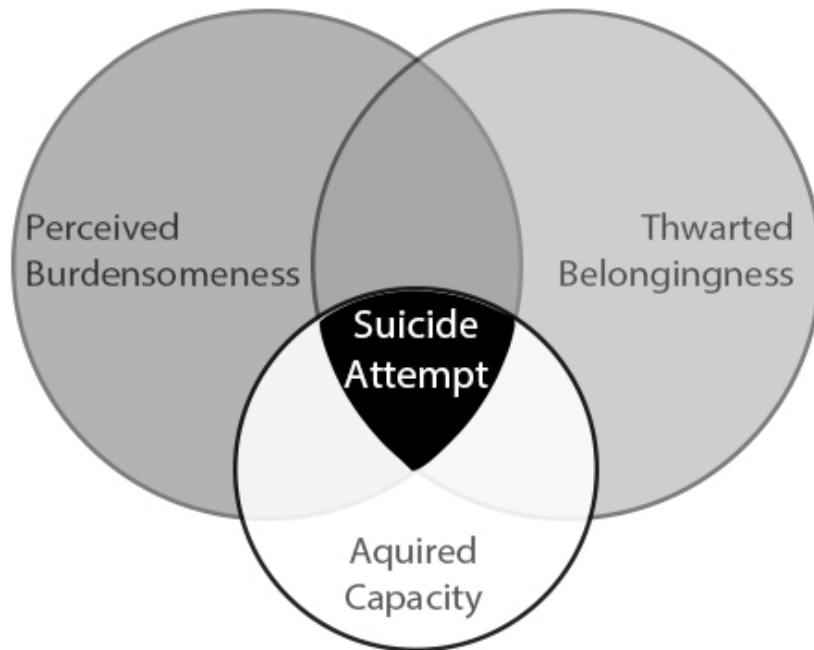
assessment after hospitalization as the effect of acquired capability persists over time.

Conversely, the more dynamic nature of thwarted belongingness and perceived burdensomeness highlights an opportunity for intervention (e.g., challenge burdensomeness-related cognitions; encourage activities that will lessen sense of burdensomeness; help promote close and supportive relationships within the family). The gender-specific pathways for suicidal behavior provide useful information about tailoring intervention in this high-risk population.

Our findings also have implications for future IPTS research. Consistent with previous studies (Bryan et al., 2010; Montheith et al., 2013), our findings call into question that all three IPTS components are essential in predicting suicidal behavior. Specifically, we suggest that the absence or contradictory effect of thwarted belongingness—when combined with perceived burdensomeness or acquired capability—is likely accounting for the lack of support for the theory and as such should be reconsidered as being its essential component. At the same time, we provide additional support for perceived burdensomeness to be considered as more prominent in IPTS. Our findings similarly suggest that the presence of gender-specific pathways might also account for why all three components, when considered simultaneously, do not appear to be essential in predicting suicide attempts. Future work is needed to replicate this pattern of findings prospectively (particularly using established measures of theory constructs and/or more inclusive indicators of acquired capability), in both adolescent and other samples, to provide more confidence in these results and help inform future theoretical advances. Our study stresses the need to consider gender-specific differences in future IPTS research. In addition, the time-limited effect of IPTS constructs in this study suggests that future longitudinal research would be strengthened by utilizing a more fine-grained analysis of these constructs at frequent assessment time points to more closely study their dynamic influence on suicidal behavior. Such a fine-

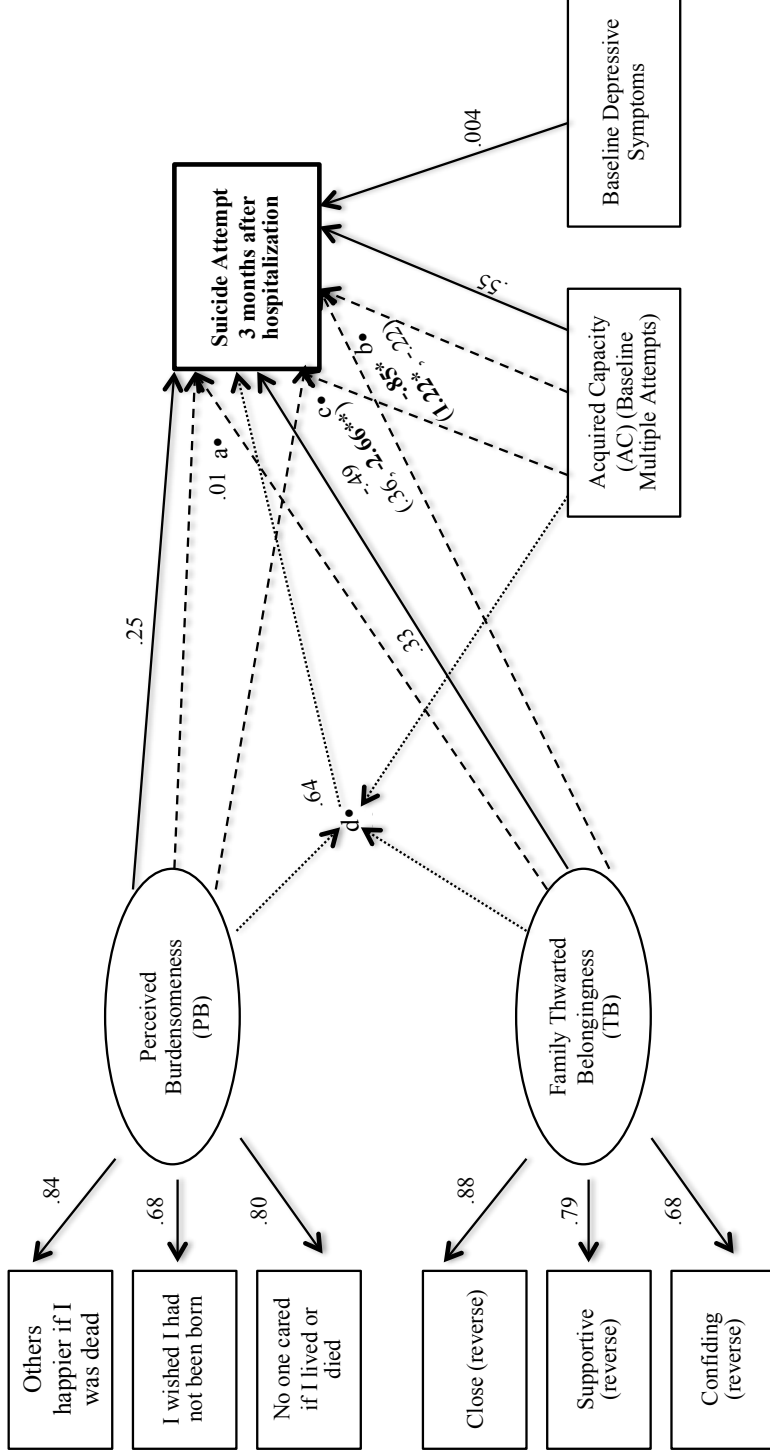
grained analysis might be particularly relevant to high-risk samples, including suicidal hospitalized populations, who may experience more shifts in thwarted belongingness and perceived burdensomeness in response to suicidal crises across time.

**Figure 4. 1** The Interpersonal-Psychological Theory of Suicidal Behavior (IPTB; Joiner, 2005; Van Orden et al., 2010)



**Figure 4. 2** Structural Equation Model of the Interpersonal-Psychological Theory of Suicidal Behavior predicting suicide

attempts 3 months after hospitalization



Notes: **1.** Solid lines indicate main effects (Model 1); **2.** Dashed lines indicate 2-way interactions where  $a\bullet = TB \times PB$  (Model 2),  $b\bullet = TB \times AC$  (Model 3),  $c\bullet = PB \times AC$  (Model 4); **3.** Dotted line indicates a 3-way interaction  $d\bullet = TB \times PB \times AC$  (Model 5); **4.** Significantly moderated effects are shown in parentheses for (girls, boys); **5.**  $*p < .05$ ,  $**p < .01$ ; **6.** All factor loadings for PB and TB are significant at  $p < .001$ .

**Table 4.1** Correlation matrix for observed study variables

Observed Variables	1	2	3	4	5	6
1. Family Twarted Belongings Total						
2. Perceived Burdensomness Total	.10	-				
3. Acquired Capacity (multiple suicide attempts yes/no)	.03	<b>.14**</b>	-			
4. Depressive Symptoms	.08	<b>.35***</b>	.07	-		
5. Suicide Attempts at Month 3	.09	.09	.08	.04	-	
6. Suicide Attempts at Month 12	.05	.07	<b>.12*</b>	.09	<b>.62***</b>	-

Note: \*p < 0.05; \*\*p < 0.01; \*\*\*p < 0.001

**Table 4.2** Predicting suicide attempts 3 months after hospitalisation

Variables	Model 1		Model 2		Model 3		Model 4		Model 5	
	B (SE)	p	B (SE)	p	B (SE)	p	B (SE)	p	B (SE)	p
Thwarted Belonging (TB)	.33 (.18)	.08	.32 (.17)	.06	-.07 (.20)	.73	.33 (.17)	.05	-.02 (.19)	.94
Perceived Burdensomeness (PB)	.25 (.26)	.33	.25 (.27)	.36	.26 (.27)	.34	.49 (.37)	.19	.48 (.34)	.16
Acquired Capacity (AC) (non-MAs as reference group)	.55 (.42)	.19	.54 (.42)	.19	.32 (.46)	.49	.67 (.42)	.11	.45 (.47)	.34
Depressive Symptoms	.004 (.02)	.82	.004 (.02)	.82	.003 (.02)	.84	.01 (.02)	.75	.004 (.02)	.79
TB X PB			.01 (.21)	.96	-.11 (.22)	.62	.01 (.22)	.98	-.36 (.20)	.07
TB X AC					<b>.85 (.41)<sup>a</sup></b>	<b>.04</b>			.70 (.37)	.06
PB X AC							<b>-.48 (.44)<sup>b</sup></b>	<b>.28</b>	-.66 (.50)	.19
TB X PB X AC									.64 (.40)	.11

Notes: N = 376; <sup>a</sup> TB X AC moderated by sex (t= 3.24, p = .07); <sup>b</sup> PB X AC moderated by sex (t= 7.43, p = .006); non-MAs = non multiple attempters

**Table 4. 3** Predicting suicide attempts 12 months after hospitalisation

Variables	Model 1		Model 2		Model 3		Model 4		Model 5	
	B (SE)	p	B (SE)	p	B (SE)	p	B (SE)	p	B (SE)	p
Twisted Belonging (TB)	.06 (.09)	.51	.06 (.13)	.67	-.08 (.17)	.62	.06 (.13)	.69	-.10 (.17)	.57
Perceived Burdensomeness (PB)	.05 (.08)	.56	.06 (.17)	.74	.06 (.17)	.73	.21 (.22)	.36	.20 (.22)	.36
Acquired Capacity (AC) (non-MAs as reference group)	<b>.32 (.16)</b>	<b>.04</b>	.56 (.29)	.05	.54 (.29)	.06	.59 (.28)	.04	.56 (.29)	.05
Depressive Symptoms	.01 (.01)	.12	.02 (.01)	.14	.02 (.01)	.14	.02 (.01)	.11	.02 (.01)	.12
TB X PB			.09 (.13)	.52	.05 (.14)	.72	.10 (.14)	.48	-.06 (.18)	.73
TB X AC					.30 (.27)	.27			.29 (.26)	.28
PB X AC							-.32 (.30)	.27	-.35 (.30)	.24
TB X PB X AC									.26 (.27)	.33

N=356; non-MAs = non multiple attempters



## **CHAPTER V: Summary and Conclusions**

The goal of this dissertation was to contribute to the understanding of how to improve suicide risk prediction among adolescents who are most vulnerable to suicidal behavior and repeated suicidal crises—i.e. psychiatrically hospitalized suicidal adolescents and youth seeking psychiatric emergency services—and for whom more accurate prediction is especially critical. The majority of these young people have numerous risk factors associated with suicidal behavior, and it is particularly important to understand what propels some of them, but not others, toward suicidal actions. Moreover, while important gains have been made in the area of risk assessment among clinical youth populations, these studies are limited in number and many lack prospective data that are essential in establishing predictive and incremental validity in addition to predictive utility of suicide risk indicators and assessment instruments.

Concerned with improving the prediction of suicide attempts and relevant psychiatric crises (psychiatric hospitalization, return visit for psychiatric emergency services), this dissertation is based on three longitudinal studies conducted in two different populations of high-risk youth (psychiatric inpatient and psychiatric emergency department). The three studies considered predictive and incremental validity, investigated predictive utility, and examined important subgroup differences (i.e. based on sex and suicide attempt history) to inform how to tailor assessment for suicidal youth. The findings from each of the three studies are summarized below.

**Study 1** examined the extent to which adolescents and young adults who are seeking services in a psychiatric emergency department are able to provide meaningful predictions of their own risk of suicidal behavior and if patients' own risk perception can be used by clinicians conducting risk assessments. Based on chart review data, the study examined predictive validity and utility (i.e. sensitivity and specificity) of an assessment approach that involved directly asking youths who sought psychiatric emergency (PE) services to self rate their future risk of suicidal behavior. The study outcomes included suicide attempts and return PE visits up to 18 months later. In addition, the study examined if these youths' own perspectives of risk can improve upon a clinician-administered suicide risk assessment instrument—Columbia Suicide Severity Rating Scale (C-SSRS)—in predicting future attempts and return visits.

The results of a Cox regression showed that self-assessed expectations were independently associated with increased risk of future suicide attempts and return PE visits for suicide-related concerns, over and above previous attempt history, sex, and severity of ideation. The area under the curve (AUC) of the receiver-operating characteristic (ROC) analyses indicated that self-assessed expectations yielded moderate to good predictive accuracy (AUCs ranged 0.73 – 0.80). A statistically significant difference between AUCs for clinician-administered ideation severity (C-SSRS) alone (AUC=0.74) and in combination with self-assessed expectations (AUC=0.80) indicated that self-assessed expectations improved the predictive accuracy of C-SSRS. These results showed that youths' ratings of their own future risk of suicidal behavior were uniquely associated with an increased risk of suicide attempts and return visits for suicide-risk related concerns (i.e. suicidal ideation, suicide attempts) during the follow-up, even after taking into account important covariates. Youths' ratings indicative of lower confidence in maintaining safety from suicidal behavior were significantly associated with

suicide attempts and return visits, pointing to benefits of considering youths' perspective in risk formulation. Moreover, youths' self-rated expectations provided incremental validity in predicting suicide attempts and return visits over and above clinician-administered assessment of suicidal ideation severity (CSSRS) and significantly improved its *accuracy*, suggesting their potential for augmenting suicide risk formulation. This naturalistic study provided initial evidence that youths presenting for PE services are able to provide meaningful predictions of their own risk of future suicidal behavior, which, in turn, augmented suicide risk formulation.

**Study 2** sought to examine the impact of post-hospitalization course of suicidal ideation on subsequent suicidal crises, including suicide attempts and psychiatric rehospitalizations, among inpatient adolescents in the year after discharge, and to identify predictors of a higher risk course after hospitalization. A period of particularly high risk for suicide attempts among adolescent inpatients is within 12 months after discharge, yet little is known about longitudinal trajectories of suicidal ideation and how these related to post-discharge risk. Three trajectory groups were identified with latent class growth modeling: (1) subclinical ideators (31.6%); (2) elevated ideators with rapidly declining ideation (57.4%); and (3) chronically elevated ideators (10.9%). The results also showed that higher baseline hopelessness was associated with persisting suicidal ideation. Based on logistic regression results, adolescents in the chronically elevated ideation group had two and four times greater odds of attempting suicide and three and 11 greater odds of rehospitalization relative to rapidly declining and subclinical groups, respectively, even after controlling for suicide attempt history.

The results of this study suggested that a substantial proportion of adolescents with elevated suicidal ideation at baseline experienced a significant decline of suicidal thoughts within the first three months after hospitalization. A smaller, but significant, proportion of adolescents

continued to experience high levels of suicidal ideation throughout the entire follow-up; these teens were also more likely to make subsequent suicide attempts and be rehospitalized, even when suicide attempt history was accounted for. These results suggested that suicidal ideation severity at hospitalization may not be an adequate marker for subsequent suicidal crises. Instead, it may be more important to identify adolescents vulnerable to persisting suicidal ideation, as they are at highest risk of psychiatric crises. One marker of consistently elevated suicidal ideation identified in the study was hopelessness, suggesting that addressing hopelessness may facilitate faster declines in ideation after hospitalization. Moreover, the results highlighted a need for consistent monitoring of these adolescents' severity of suicidal ideation after discharge.

**Study 3** examined a suicide risk framework based on a known theory of suicidal behaviors—the Interpersonal-Psychological Theory of Suicidal Behavior (IPTS), which hypothesizes a proximal pathway to suicidal behavior based on three constructs—thwarted belongingness, perceived burdensomeness, and an acquired capability for lethal self-injury—to determine how well it predicts post-hospitalization suicide attempts within a sample of adolescents who were psychiatrically hospitalized for suicide risk. The theory proposes that suicidal behavior takes place when an individual has both the desire for death—comprised of thwarted belongingness and perceived burdensomeness—and an acquired capability for lethal self-injury. Structural equation modeling (SEM) was used to examine two IPTS models predicting more immediate risk of suicide attempts within three and more distal risk within 12 months after hospitalization. We examined the interactions between two latent factors of perceived burdensomeness and thwarted belongingness, and an observed acquired capability

variable (multiple suicide attempts), all assessed at hospitalization. Multi-group analyses were conducted to examine if these relationships varied by sex.

The results of this study revealed partial support for IPTS in an adolescent sample and raised questions about the relative importance of all theory components. Specifically, the three-way interaction between perceived burdensomeness, thwarted belongingness, and acquired capability was not significantly associated with suicide attempts. Instead, there were sex-specific associations between theory components and suicide attempts. For boys, perceived burdensomeness combined with acquired capability was a salient pathway toward suicide attempts three months post hospitalization. On the other hand, thwarted belongingness was an especially important risk factor for girls with low acquired capability. The finding that perceived burdensomeness combined with acquired capability predicted suicide attempts among boys, but not girls, is noteworthy because of the difficulty in identifying clinically valuable risk factors for suicidal behavior among high-risk adolescent males (King et al., 2013). Importantly, only acquired capability predicted attempts at 12 months, which was not moderated by sex. The time-limited effect of these associations—i.e. showing significant associations at month three but not 12—suggested that belongingness and burdensomeness are dynamic and modifiable in high-risk populations, whereas the effects of acquired capability are more lasting. The more dynamic nature of thwarted belongingness and perceived burdensomeness could thus inform intervention approaches—perhaps tailored based on sex—with suicidal youth, while the lasting effect of acquired capability pointed to importance of prevention and maintenance of behaviors and experiences that increase acquired capability (e.g., initiation of suicidal behavior, transition from one-time to multiple attempt status). This study also added to the literature by offering the first

prospective examination of the theory, considering its developmental appropriateness in explaining adolescent suicidal behavior, and examining sex as a moderator.

Taken together, utilizing two different samples of youths seen in psychiatric settings, this dissertation prospectively examined indicators of risk associated with suicide attempts and suicide-related crises (return to psychiatric emergency department for suicide-related concerns, rehospitalization), over and above known risk factors. Important indicators of risk associated with suicide attempts and suicide-related crises identified in these studies included: persisting suicidal ideation, sense of being a burden on others (for adolescent males, and when accompanied by acquired capability for suicidal behavior), sense of thwarted belongingness (particularly for adolescent females, and when accompanied by low acquired capability), and self-rated low confidence in ability to keep oneself from attempting suicide. The latter accurately classified a significant portion of adolescents and young adults who later attempted suicide and improved the accuracy of clinician-rated suicidal ideation severity. Though additional work is needed to replicate these findings, the three studies pointed to several valuable targets of inquiry for suicide risk assessment with implications for informing risk formulation and interventions to prevent suicidal behavior in at-risk youth.

Of note is that, as described above, some of these risk indicators—i.e. burdensomeness and thwarted belongingness—were moderated by sex and previous history of suicide attempts, suggesting varied effects among at-risk subgroups and, more generally, highlighting that adolescents at risk for suicide are a heterogeneous group. Providing further support for the heterogeneity of this population, findings from Study 2 suggested that adolescents at-risk for suicide follow distinct post-discharge course of suicidal ideation with regard to severity and

chronicity, which subsequently had varying influence on post-discharge suicide attempt and rehospitalization risk. Considering this heterogeneity, a single approach to assessment may not be clinically beneficial for all suicidal youth with respect to ameliorating all risk indicators. At the same time, the association between some indicators of risk examined in this dissertation and suicide-related outcomes did not vary by sex or previous attempt history. Most notably, in general, self-assessed expectations of future risk, which were examined in Study 1, had similar predictive power with regard to future suicide-related outcomes irrespective of sex or multiple attempt status. In addition, the acquired capability construct (i.e. multiple suicide attempt history), examined in Study 3, was associated with suicide attempts 12 months after hospitalization for both male and female adolescents. Taken together, these findings highlighted the importance of considering sex and attempt history differences in future research to help identify specific pathways for suicidal behavior, which, in turn, could provide useful information about when tailoring of assessment approaches and interventions in this high-risk population might be indicated. Along these lines, these findings also pointed to the importance of considering synergistic effects of multiple risk factors as being especially relevant for assessment and intervention with high-risk youth.

Finally, this dissertation highlighted the dynamic nature of risk factors and the importance of utilizing more fine-grained analyses at frequent assessment time points (e.g. Ecological Momentary Assessment [EMA]) in future work to adequately capture these changes and their influence on suicide risk. This might be especially relevant among high-risk youth who experience frequent shifts in risk factors. For example, Study 2 showed that the majority of adolescents discharged from psychiatric hospitalization experienced a significant reduction in severity of suicidal ideation within the first three months and that addressing hopelessness might

be important in facilitating this reduction. In Study 3, there was a time-limited effect of perceived burdensomeness and thwarted belongingness—when combined with acquired capability—on increased risk of suicide attempts, which was shown at three, but not at 12, months after discharge. Studying the dynamic or, conversely, more lasting nature of risk indicators could have important implications for developing interventions for at-risk youth and understanding stability and predictive power of these indicators across time. This could help improve our understanding of not only who is at risk, but also when they are most at risk. It is important to acknowledge that our focus on outcomes studied within a 12-month and up to 18-month follow-up period provides less information about short-term or acute risk. There have been recent calls (e.g., Glenn & Nock, 2014) for studying risk factors associated with more immediate or acute suicide risk that could aid in identifying risk of suicidal behavior within hours or days of assessment—which may be most clinically relevant for assessing and intervening with at-risk individuals. As such, future work is needed to both incorporate more frequent assessment time points over longer periods of time to better study the stability or time-varying effect of predictors and to also focus on shorter follow-up periods to examine predictors of acute risk.

Despite a great deal of knowledge gained over the past several decades, the prevalence of suicidal behavior and suicide-risk related events continues to be a significant public health problem. Identifying youth who are at risk for suicidal behavior is challenging and requires continued efforts to improve our understanding of factors and assessment approaches that could meaningfully aid in the prediction of suicide risk, contribute clinical value to suicide risk formulation with at-risk youth, and, ultimately, help prevent youth suicide. The goal of this



dissertation was to aid these efforts and add to the knowledge of risk indicators that are prospectively associated with suicide attempts and suicide-related crises (return to psychiatric emergency department for suicide-related concerns, rehospitalization) in two psychiatric samples of youths. Building on the findings reported in this dissertation, to help improve the accuracy of predicting suicidal behavior, future research could benefit from greater focus on heterogeneity and subgroup differences among high-risk youth, an emphasis on synergistic effects of multiple risk factors, and a consideration of time-varying effects of predictors on suicidal behavior and suicide-risk related crises.

## APPENDIX

### Study 1. Self-Assessed Expectations of Suicide Risk Scale

#### ABOUT MYSELF

Sometimes people may feel that life is not worth living or have thoughts of ending their life.

For some, these thoughts happen once in a while. For others, these thoughts can be more ongoing or lead to suicide attempts. For each question, please circle the answer that best describes you.

1. How confident are you that you **WILL NOT** attempt suicide in the future?

0	1	2	3	4	5	6	7	8	9	10	UNSURE
Not at all Confident				Somewhat Confident				Completely Confident			

2. If you have thoughts of killing yourself in the future, how confident are you that you **WILL BE ABLE TO KEEP YOURSELF** from attempting suicide?

0	1	2	3	4	5	6	7	8	9	10	UNSURE
Not at all Confident				Somewhat Confident				Completely Confident			

3. If you have thoughts of killing yourself in the future, how confident are you that you **WILL TELL** someone?

0	1	2	3	4	5	6	7	8	9	10	UNSURE
Not at all Confident				Somewhat Confident				Completely Confident			

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