



# Ecological assessment of daily suicidal thoughts and attempts among suicidal teens after psychiatric hospitalization: Lessons about feasibility and acceptability

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## ABSTRACT

Despite its potential to yield information about the dynamic course of suicidal ideation/behavior in individuals' natural environment, Ecological Momentary Assessment (EMA) has been strikingly underutilized among suicidal teens. This study reports on feasibility and acceptability of ecological assessment of daily suicide risk-related outcomes ("daily diaries," a special case of EMA) among adolescent inpatients in the critical post-discharge period. Thirty-four adolescents (76% female; ages 13–17) responded to daily electronic surveys for four weeks after discharge. Survey adherence was 69% ( $n = 650$  days) and decreased each week. Adherence was half as likely among adolescents without attempt history (OR = 0.50, CI = 0.27–0.95). Mid- and end-point study responses indicated high acceptability of daily diaries. Most adolescents reported no change or more positive change in their thoughts/mood after daily surveys. Suicidal ideation was reported on 24.4% ( $n = 159$ ) of the days. In the month post discharge, more teens reported suicidal thoughts using daily surveys (70.6%) compared to end-of-study assessment (45.2%) (Chi-square = 4.24,  $p = .039$ ). Two participants (5.9%) reported an attempt. Ideation frequency and duration varied across time, suggesting utility of frequent assessments in this context. EMA data collection with high-risk adolescents offers a feasible approach to examining real-time suicidal ideation/behavior, yielding nuanced information that is critical to advancing suicide prevention efforts.

## 1. Introduction

Youth suicide, the second leading cause of death among adolescents (Centers for Disease Control and Prevention, 2015), has tragically increased in recent years (Curtin et al., 2016). Despite a great deal of knowledge concerning suicide risk and protective factors gained over the past several decades (see reviews by Bridge et al., 2006; Gould et al., 2003; Spirito and Esposito-Smythers, 2006), less is known about immediate (within hours or days) precursors to suicidal behavior that may be most clinically relevant (Glenn and Nock, 2014). The majority of existing studies have relied on longer assessment windows (weeks, months, or years), which precludes conclusions about who is at *imminent* risk for suicidal behavior and when (Bagge et al., 2013; Rudd et al., 2006). Indeed, a recent meta-analysis of longitudinal studies focusing on suicidal ideation and attempts indicated that the average follow-up period was almost 7 years (Ribeiro et al., 2016). However, to capture the dynamic nature of suicidal ideation and other suicide risk factors in the near-term requires more fine-grained analyses at frequent

assessment time points. This might be especially relevant for high-risk youth in clinical settings who experience considerable shifts in suicide risk factors, such as suicidal ideation following psychiatric hospitalization (Czyz and King, 2015; Goldston et al., 1999; Prinstein et al., 2008).

### 1.1. Ecological momentary assessment and suicide risk-related outcomes

Largely underutilized in the field of suicide prevention (Davidson et al., 2017; De Beurs et al., 2015), ecological momentary assessment (EMA) (also known as experience sampling or diary studies) allows for intensive and repeated assessment of behavior in real-time and in the person's natural setting, thus minimizing recall bias and maximizing ecological validity (Moskowitz and Young, 2006; Shiffman et al., 2008). EMA strategies have the potential to yield more nuanced information about the temporal course of immediate precursors to suicidal behavior and the complex interplay between risk and protective factors in the person's natural environment. On a more

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fundamental level, EMA can reveal important information about the daily course and characteristics of suicidal thoughts (e.g., frequency, severity), which constitutes another important gap in the literature (Nock et al., 2009).

EMA approaches have been shown to be feasible with psychiatric adult and teen populations (Armey et al., 2015; Ebner-Priemer and Trull, 2009; Kaminer et al., 2006; Thompson et al., 2014; Wen et al., 2017), including studies assessing non-suicidal self-injurious thoughts and behavior (Armey et al., 2011; Santangelo et al., 2016; Selby et al., 2013; Turner et al., 2016). However, relatively few EMA studies explicitly assessing suicidal ideation and behavior (i.e. suicide attempts) have been carried out (see review by Davidson et al., 2017). Using a range of methods (PDAs, paper-based diaries, mobile phones) and assessment schedules (from once-daily to multiple times each day), studies assessing suicidal ideation or behavior have thus far been conducted among inmates (Humber et al., 2013), psychiatric inpatients (Ben-Zeev et al., 2012; Hallensleben et al., 2017; Kleiman et al., 2017), individuals recruited from the community or outpatient clinics (Law et al., 2015; Links et al., 2007; Torous et al., 2015), adults with previous suicide attempts (Husky et al., 2014; Kleiman et al., 2017), as well as self-injuring youth from the community (Nock et al., 2009). While these studies have made important contributions, there remain critical gaps concerning carrying out EMA data collection with individuals at risk for suicide. First, while most of these studies involved high-risk samples, only one (Husky et al., 2014) followed individuals during a high-risk period following psychiatric hospitalization. Second, the majority of EMA studies with suicidal individuals included a relatively short follow-up period (one or two weeks). Third, with one notable exception (Nock et al., 2009), EMA studies assessing suicidal ideation and behavior have been primarily conducted with adults, despite the fact that suicidal ideation and behaviors increase rapidly during adolescence (Nock et al., 2013). In particular, to our knowledge, EMA methods have not been utilized with suicidal teens after psychiatric hospitalization. This is a critical gap given that these teens are vulnerable to suicide attempts, rehospitalizations, and persistent suicidal ideation after discharge (Brent et al., 2013; Czyz and King, 2015; Czyz et al., 2016; Goldston et al., 1999; Yen et al., 2013), yet surprisingly little is known about clinically relevant information, such as post-discharge prevalence and characteristics of suicidal thoughts, on a daily level.

## 1.2. Current study

EMA studies have been strikingly underutilized with high-risk teens and, in particular, with suicidal teens following hospitalization. Given the ubiquity and acceptability of mobile communication among adolescents (Lenhart, 2015), a key barrier to implementing EMA studies with high-risk teens may thus be less influenced by technological limitations but is likely driven by procedural concerns, such as monitoring and managing risk. Previous studies with adults at risk for suicide provided automated prompts encouraging help seeking (Husky et al., 2014; Law et al., 2015) while the study involving youth recruited in the community (Nock et al., 2009) also included additional monitoring of responses and, if needed, contacting participants for risk assessment the following day. However, conducting repeated assessment of suicidal ideation and behavior with teens during a high-risk period following hospitalization when suicide-related crises may be more frequent requires additional and careful consideration of the critical issue of how and when to intervene when acute risk is indeed reported. In light of the aforementioned research gaps, and with the goal of paving the way for greater utilization of EMA procedures in studies with high-risk teens, this study sought to: (1) specifically address the feasibility and acceptability of an ecological assessment protocol for collecting daily suicide-risk related outcomes (i.e. suicidal ideation, suicide attempt) among high-risk suicidal adolescents followed after psychiatric hospitalization; (2) given that suicidal ideation and behavior were assessed repeatedly, explore factors associated with daily survey adherence; and

(3) describe suicidal thoughts reported via daily surveys and compare these to suicidal thoughts reported at the end-of-study assessment. To achieve these goals, this study utilized daily diaries, which are a special case of EMA (Shiffman et al., 2008), for one month after discharge from hospitalization.

## 2. Methods

### 2.1. Participants

Participants were psychiatrically hospitalized adolescents (ages 13–17) admitted due to last-month suicide attempt and/or last-week suicidal ideation. Participants were recruited to participate in a pilot study of a brief psychosocial intervention, which took place at the time of hospitalization, with a daily follow-up assessment component (Czyz et al., under review). Exclusion criteria included: severe cognitive impairment or altered mental status (e.g., active psychosis or mania), transfer to medical unit or residential placement, no availability of a legal guardian (ward of state), and teen not having a cell phone with text messaging capability. Once inclusion and exclusion criteria were verified, based on a screening of admission records and consultation with inpatient team as needed, adolescents and their parents were approached to obtain consent and assent. Of the 50 potentially eligible participants, two (4%) did not own their own cell phone and one (2%) did not have cell phone access for disciplinary reasons. Of those meeting all eligibility criteria, 36 (76.6%) provided parental consent and teen assent. The analytic sample for this study was limited to 34 adolescents who continued in the study after baseline assessment (one teen withdrew from the study) and who continued to meet eligibility criteria following discharge (one teen no longer had a cell phone).

### 2.2. Procedures

The study was approved by the participating university's Institutional Review Board.

#### 2.2.1. Assessment

Participants completed a series of self-report surveys during hospitalization. Following discharge, participants completed a brief online survey approximately 1–2 weeks after hospitalization and were also contacted two additional times by master's level clinicians to complete two phone-based assessments approximately 1 and 3 months after hospitalization.

#### 2.2.2. Ecological assessment with daily diaries

Starting on the first day after the discharge, adolescents were asked to complete one survey each evening for 28 consecutive days. A single assessment per day (daily diary) is a special case of EMA (Shiffman et al., 2008), and this approach was selected in light of practical considerations (e.g., many teens had cell phone use restrictions while in school; greater ability to carry out risk management protocol [see below] when both teen and parent could be reached in the evening). A link to the survey, developed using Qualtrics survey tool (<http://www.qualtrics.com>), was sent to participants' phones via text messages. Text messages were sent automatically and according to a pre-specified schedule using a secure research platform called TeEMA (Fernandez et al., 2013). Text messages were chosen to deliver daily surveys, rather than push notifications via a smartphone app, because unlike cell phones, smartphone ownership shows greater disparity based on household income and tends to be less common among teens, particularly younger adolescents (Lenhart, 2015). Participants had the option to fill out the survey on their smartphone or to copy the link in an internet browser on a computer. Because cell phone access for teens may at times be limited for disciplinary reasons, this approach allowed for the survey to be mobile compatible while ensuring that participants could respond to the survey even if their phone was restricted. The text

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