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ORIGINAL RESEARCH

Dual Assessment of Suicidal Risk: Integrating the Clinician-Administered CHRT-Beh and Self-Report CHRT-SR$_9$: Findings From the T-RAD Study

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Background: Suicide prevention requires reliable assessment tools, integrating the Food and Drug Administration (FDA)-endorsed Columbia Classification Algorithm of Suicide Assessment domains and psychological risk factors, capturing patient-reported experiences and clinician-reported characterizations of suicidality comprehensively. The 9-item Concise Health Risk Tracking – Self-Report (CHRT-SR$_9$) is a patient-reported outcome that was designed to capture suicide-related constructs such as pessimism, helplessness, despair, and suicidal thinking/planning. The semi-structured, clinician-administered CHRT-Behavior (CHRT-Beh) scale was created to capture recent suicidal events (ideation and behaviors) in alignment with the FDA-endorsed system for coding suicidality. In this report, we present a two-step approach for assessing suicidality and provide preliminary data for the dual use of the CHRT-SR$_9$ and CHRT-Beh.

Methods: Data from the Texas Resilience Against Depression (T-RAD) cohort were used for the analysis. T-RAD consists of two datasets, one with participants with a history of depression and healthy controls (D2K, n=1040, ages 10 and above) and one with youth ages 10–24 years at risk for depression (RAD, n=365). Participants completed both the CHRT-SR$_9$ and CHRT-Beh at study entry.

Results: Using the CHRT-Beh, a subset of D2K participants aged ≥ 24 years reported suicidal ideation (14.07%), non-suicidal self-injury (1.11%), and self-injurious behavior (0.28%) in the past week. Findings were similar in D2K participants aged 10–24 years. A subset of RAD participants (1.64%) reported suicidal ideation without attempt or self-injurious behavior in the past week. Participants who reported suicidal ideation on the CHRT-Beh had significantly higher CHRT-SR$_9$ total scores (17.1 ±7.4 vs 5.6 ±6.2; p<0.0001) and CHRT-SR$_9$ suicidal ideation subscale scores (4.0 ±3.1 vs 0.6 ±1.7; p<0.0001) than those without suicidal ideation.

Conclusion: The co-administration of CHRT-SR$_9$ and CHRT-Beh provides researchers with a suicidality risk measure and a retrospective assessment of suicidal behaviors. The CHRT-SR$_9$ and CHRT-Beh package provides a holistic clinical evaluation of suicidal risk meeting regulatory requirements.

Keywords: concise health risk tracking – self report, concise health risk tracking – behavior, Columbia classification algorithm for suicide assessment, Columbia suicide severity rating scale

Introduction

In 2023, suicide was the second leading cause of death among those between the ages of 10 and 34, the fourth leading cause of death among those between the ages of 35 and 44, and the eleventh leading overall cause of death in the United States.[1] Despite numerous public health efforts, suicide rates have continued to increase from 2000 to 2022 (age-adjusted rates of 10.4 and 14.2 per 100,000 in 2000 and 2022, respectively).[2] Suicidal ideation and suicide attempts are also major public health concerns, with the past-year prevalence of suicidal ideation among adults being 5% and among adolescents

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being 12.3%, and of suicidal attempts among adults being 0.6% and among adolescents being 3.3% in 2023.[3] Adolescents are most vulnerable to suicidal thoughts and behaviors, with approximately one-third of adolescents with suicidal ideation having a plan and approximately 60% of those with a plan attempting suicide, the majority of which occur within a year of the onset of suicidal ideation.[4] Thus, robust and holistic screening measures with excellent psychometric properties and validity are needed to capture suicidal ideation, propensity, and behavior early to implement comprehensive care and prevent future attempts.

Suicidality refers to a broad spectrum of self-harm-related thoughts and behaviors, including suicidal ideation, planning, suicide attempts, and death by suicide. Assessing suicidality remains challenging due to its complexity and varied presentations. Numerous self-report and clinician-rated instruments have been developed to assess suicidal ideation, attempts, other suicidal behaviors, and deaths by suicide. Some of the more common measures include the Beck Scale of Suicide Ideation (BSSI),[5] the Suicidal Ideation Questionnaire (SIQ),[6] the Self-Injurious Thoughts and Behaviors Interview (SITBI),[7] and the Suicide Attempt Self-Injury Interview (SASII).[8] Research often relied on spontaneous reports of suicide-related adverse events, leading to inconsistent terminology and classification of suicidal behaviors.[5,9,10] Additionally, relying on patient versus clinician-reported outcomes further muddled the language. Although these measures have previously been used to screen for suicidality in adults and adolescents, inconsistent findings in their performance across the lifespan warrant the development of new tools to assess all psychopathological aspects of suicidality.[11–15]

To standardize terminology related to suicide, the Food and Drug Administration (FDA) endorsed the Columbia Classification Algorithm of Suicide Assessment (C-CASA) in 2007,[16] a standardized classification system that includes nine event codes: 1) Death by suicide (referred to as "Suicide completed" in C-CASA); 2) Suicide attempt; 3) Preparatory acts toward imminent suicidal behavior; 4) Suicidal ideation; 5) Self-injurious behavior, intent unknown; 6) Not enough information, fatal; 7) Self-injurious behavior, no suicidal intent; 8) Other, accident, psychiatric, medical; and 9) Not enough information, nonfatal.[17] While C-CASA improved classification in research settings based on identifying suicide event characterization, it is not a real-time clinical assessment tool capable of tracking patients' suicidal thoughts and behaviors.

To address this gap, the Columbia-Suicide Severity Rating Scale (C-SSRS) was developed in 2011, building upon the C-CASA framework.[18] C-SSRS was designed as a structured, clinician-administered assessment tool to evaluate suicidal ideation, intent, preparatory actions, and suicide attempts, providing a retrospective assessment of suicide risk across different timeframes. It is widely used in both research and clinical settings. C-SSRS does not generate C-CASA classifications directly. Instead, responses on the C-SSRS must be retrospectively mapped onto the C-CASA categories, which require additional post-processing and interpretation. Furthermore, while C-SSRS provides a structured approach to assessing suicidal ideation and behavior, it does not capture the broader psychological factors, such as pessimism, helplessness, and despair, that have been strongly linked to suicide risk. Given that these psychological constructs often precede suicidal behavior, tools that measure them can provide earlier signals of risk and thereby improve suicide prevention efforts.

To bridge this gap, the Concise Health Risk Tracking Self-Report (CHRT-SR) was developed as part of the NIMH-funded Suicide Assessment Methodology Study.[19] The original 12-item CHRT-SR included three direct items on suicidal thoughts, as well as items related to pessimism, helplessness, despair, and lack of social support. Items are self-referent statements about the respondent's feelings in the past week, marked on a 5-point Likert scale (strongly disagree to strongly agree). Over time, variations of the CHRT-SR were developed to include additional items on impulsivity and irritability. The psychometric properties of these versions, including reliability, clinical utility, and predictive validity, have been extensively studied in various clinical populations, including patients with unipolar or bipolar depression,[20–23] individuals with comorbid bipolar disorder and PTSD,[24] and those with stimulant use disorder,[25,26] adolescents[27,28] and in treatment studies assessing intervention outcomes.[29–31]

A nine-item subset of the CHRT-SR (henceforth CHRT-SR_9) emerged in recent years, covering items related to pessimism, helplessness, despair, and suicidal thinking/planning, which were previously shown to predict future suicidal ideation and behaviors.[32–35] CHRT-SR_9 has stable content, construct validity, and strong reliability. Its scoring scheme is designed to measure the intended construct, with a low burden on respondents.[36,37] The CHRT-SR_9 was found to predict later suicide events and attempts in a sample of acutely depressed youth with similar sensitivity and greater specificity than the C-SSRS.[37] Overall, it is a useful screening tool for suicidality across the age spectrum (ages 12 years and older)

and primary care and psychiatric care outpatient settings; it has utility as a tool for research studies and clinical management in patients with depression.[38,39] Higher scores on the CHRT-SR_9 indicate higher suicide risk severity, with score ranges of none (0–14), mild (15–21), moderate (22–26), or severe (27–36).[40]

While CHRT-SR_9 is an effective patient-reported outcome measure (PROM) for assessing suicidal risk, it does not classify suicidal behaviors according to FDA-recommended standards. A systematic review of the efficacy of self-harm and suicide risk assessment tools in predicting future self-harm and suicide events and outcomes revealed limited evidence supporting the use of standalone risk assessment tools, including clinician-rated scales.[15] Previous studies highlighted that two or more risk assessment tools were more effective in predicting future self-harm and suicidality than a single tool.[41,42] While self-report measures are potentially effective in predicting future behaviors,[22,23,41] integrating clinician-rated tools with the self-report tools can boost clinical performance. Thus, we hypothesize that augmenting the CHRT-SR_9 with a clinician-rated instrument will ultimately improve its predictive potential, sensitivity, and specificity. To this end, the 9-item clinician-rated CHRT-Behavioral Module (CHRT-Beh) was developed as a companion measure to CHRT-SR_9 to characterize patient-reported features of suicidality. Thus, the self-reported CHRT-SR_9 captures the internal state of the patient for clinicians to assess suicidal propensity, and the clinician-administered CHRT-Beh captures events retrospectively. CHRT-Beh is a clinician-administered semi-structured interview that systematically assesses suicidal behavior domains in alignment with the C-CASA algorithm, ensuring consistency with regulatory guidelines. This paper introduces CHRT-Beh and its alignment with FDA-mandated requirements for assessing suicidal ideation and behavior. We also describe how CHRT-Beh can be seamlessly integrated as a clinician-rated companion to CHRT-SR_9, enhancing the comprehensive evaluation of suicidality. We present a report showcasing the complementary roles of these measures in suicidality assessment using data collected concurrently on the CHRT-SR_9 and CHRT-Beh from a large sample of participants (ages 10 years and older) enrolled in the Texas Resilience Against Depression (T-RAD) project.

Methods

Description of the CHRT-Beh Instrument

The 9-item clinician-rated CHRT-Beh was developed to retrospectively identify and classify suicidal ideation and behavior into the C-CASA domains. These domains include: 1) suicidal ideation (C-CASA Domain 4), 2) suicide attempt (C-CASA Domain 2), 3) self-injurious behavior without suicidal intent (C-CASA Domain 7), 4) preparatory actions toward suicidal behavior (C-CASA Domain 3), 5) completed suicide (C-CASA Domain 1), 6) self-injurious behavior with unknown intent (C-CASA Domain 5), 7) fatal events without enough information to classify as suicide (C-CASA Domain 6), 8) non-suicidal other (C-CASA Domain 8), and 9) nonfatal events without enough information to classify as suicidal (C-CASA Domain 9).

The CHRT-Beh provides several standardized prompts that guide clinicians to ensure consistent classification of suicidal events. Responses to all items are recorded as "Yes" or "No". Additional follow-up questions help clinicians gather detailed information about the reported events. For example, frequency and severity are assessed for Suicidal Ideation, and the method of attempt is documented for Suicide Attempt. For Preparatory Acts, additional information delineates whether the event was a) taking preparatory actions, b) an interrupted attempt (ie, someone else interrupted or stopped the individual before suicidal action could be taken), or c) an aborted attempt (ie, the individual stopped themselves before acting). If insufficient information is available at the time of evaluation, the response is coded as "Not enough information." Clinicians are encouraged to gather collateral data from medical records, family members, or law enforcement when direct information is unavailable. Table 1 provides an overview of the CHRT-Beh items, with each item mapped onto the corresponding C-CASA domain.

The scale is designed to obtain a baseline rating and subsequent ratings to identify events occurring during the study or treatment. On a patient's first visit in a clinical trial, the CHRT-Beh collects information on the domains for two timeframes: the patient's experiences in the past week and over their lifetime. On subsequent visits throughout the clinical trial, the CHRT-Beh collects information from the past week (aligning with the CHRT-SR_9) and may additionally include "since last visit/administration", if relevant in the context of a specific trial (eg, to ensure capture of all suicidal

Table 1 Overview of CHRT-Beh Items

CHRT-Beh Item	C-CASA Domain	Brief Description
1. Suicidal Ideation	Domain 4	Suicidal ideation (SI) is defined as passive thoughts about wanting to be dead or active thoughts about killing oneself
2. Suicide Attempt	Domain 2	Suicide attempt is defined as a potentially self- injurious behavior, associated with at least some intent to die, as a result of the act
3. Self-Injurious Behavior Without Suicidal	Domain 7	Self-injurious behavior without suicidal intent is defined as a self-injurious behavior associated with no intent to die
4. Preparatory Actions Toward Imminent Suicidal Behavior	Domain 3	Preparatory actions toward an imminent suicidal behavior are when the individual takes steps to injure him- or herself, but is stopped by self or others from starting the self-injurious act before the potential for harm has begun.
5. Completed Suicide	Domain 1	A completed suicide is coded if self-injurious behavior results in a fatality and was associated with at least some intent to die as a result of the act
6. Self-Injurious Behavior Intent Unknown	Domain 5	Self-injurious behavior with unknown intent is defined as a self-injurious behavior where associated intent to die is unknown and cannot be inferred
7. Death of Unknown Intent: Not Enough Information	Domain 6	Death where there is insufficient information to determine whether the event involved deliberate suicidal behavior or ideation
8. Other (Accident, Psychiatric, Medical)	Domain 8	The "Other" category is positively endorsed if there is non-purposeful injury that could have resulted in death or hospitalization, but there is no evidence of any suicidality or deliberate self-injurious behavior associated with the event
9. Nonfatal Event: Not Enough Information	Domain 9	A nonfatal event where there is insufficient information to determine whether the event involved deliberate suicidal behavior or ideation

events over the duration of the trial). This may be especially pertinent to interventional trials of Central Nervous System (CNS)-related investigational products, which specifically focus on treatment efficacy and safety.

CHRT-Beh is a semi-structured, clinician-rated instrument that was specially designed to classify suicidal ideation and behavior in accordance with the FDA-endorsed C-CASA. Since it is not meant to assess a latent psychological construct, conventional psychometric properties, including internal consistency and test-retest reliability, are not applicable. Instead, its value lies in its standardized format, content validity, and compliance with regulatory reporting standards. During the developmental stage, the CHRT-Beh underwent expert review for face and content validity, and the current version is the result of iterative refinement through ongoing application, evaluation, revision, and reimplementation in real-world settings. The CHRT-Beh has been widely implemented across multiple center studies, including the one mentioned below. The next step is to formally assess its acceptability and feasibility among clinicians by looking at completion rates, time burden, and user feedback. These findings will help with integration into standard practice and wider clinical utility.

Study Design and Participants

Data was collected as part of the T-RAD study, which was conducted at a large urban academic center. The study procedures, eligibility, and baseline characteristics of the T-RAD cohort have been reported previously.[43,44] Briefly, the T-RAD cohort comprises participants recruited through two sister studies, as described below.

1. D2K: Study participants included individuals aged 10 years and older with a lifetime or current diagnosis of a mood disorder, as determined by the Mini-International Neuropsychiatric Interview (MINI).[45] Participants without a psychiatric history were included as healthy controls. Individuals with a history of schizoaffective disorders, schizophrenia, chronic

psychosis, Hepatitis B, Human Immunodeficiency Virus (HIV), Hepatitis C, a current need for hospitalization for suicide risk, or a psychiatric disorder at the time of consent were not eligible for participation.

2. Resilience Against Depression (RAD): Study participants included adolescents and young adults (ages 10–24 years) classified as at risk for depression and related disorders,[43] which included at least one of the following at-risk conditions: a personal history of trauma, anxiety disorders, substance use disorders (SUDs), conduct disorders, or parental history of mood disorders, suicide attempts/death by suicide, and substance use disorders. The personal history was determined using the MINI diagnoses and the mental health history questionnaire. The parental history was determined using the family health screening questionnaire. A specific type or level of risk was not required for study inclusion. As the study aimed to recruit at-risk youth, exclusion criteria included a current or lifetime diagnosis of mood disorders per MINI or a Patient Health Questionnaire 9-item (PHQ-9) score of 10 or higher.

The different objectives of D2K and RAD are reflected in the variations in their inclusion and exclusion criteria. While RAD concentrated on early detection and prevention among at-risk children and young adults, D2K sought to define mood disorder trajectories in clinical populations. So, RAD purposefully excluded youth with mood disorder diagnoses to examine those with heightened risk but no clinical onset, while D2K included people with lifetime or current mood disorders.

Study Procedures

Both studies followed a similar design, beginning with a baseline visit. Participants then completed longitudinal in-person study visits every 3–6 months, along with periodic remote assessments over multiple years. During these study visits, participants completed self-report measures, as well as clinician-rated interviews and biological assessments (eg, EEG, blood samples, neuroimaging) as specified by the protocol.[43,44] A licensed study clinician administered the CHRT-Beh during screening, baseline, and follow-up visits. If a participant reported suicidal ideation during in-person visits on the CHRT-SR_9, a licensed clinician completed CHRT-Beh and a safety assessment. If a participant reported suicidal ideation during remote assessments, a licensed study clinician engaged the participant and completed follow-up procedures. During monthly survey reviews, if a participant reported suicidal ideation in CHRT-SR_9, the clinical research coordinators notified the study clinician, who then completed further assessment using CHRT-Beh and other safety assessments, as needed. The current report includes the baseline CHRT-SR_9 and CHRT-Beh data of the locked dataset as of March 2023.

Study Measures

Demographic measures included sex (Male, Female), age, race (White, Black or African American, Asian, more than one race), and ethnicity (Hispanic/Non-Hispanic). Depression was measured using the 9-item Patient Health Questionnaire (PHQ-9).[46] Suicidal risk was measured by the CHRT-SR_9, and a record of past suicidal events was assessed by the CHRT-Beh.

Ethical Approval

The Institutional Review Board (IRB) at the University of Texas Southwestern Medical Center (UTSW) approved the T-RAD study protocols according to the Declaration of Helsinki (IRB: STU 112015–021 and STU 062016–042). The T-RAD studies are registered with ClinicalTrials.gov (D2K: NCT02919280, RAD: NCT03458936). Adult participants and a parent/guardian of all participants under 18 years provided written informed consent. Participants under 18 years provided written informed assent.

Statistical Data Analysis

Demographic and clinical characteristics of the sample were described using means and standard deviations (SDs) for continuous variables and frequencies and percentages for categorical variables. Group differences were analyzed using independent samples *t*-tests for continuous variables (due to the large sample size and approximately normal distribution of CHRT-SR_9 scores) and chi-square tests for categorical variables. Differences in CHRT-SR_9 total and subscale scores between participants endorsing versus not endorsing suicidal ideation on CHRT-Beh were assessed using independent

samples t-tests. CHRT-Beh had very few (<2%) missing data and were not imputed. Participants with incomplete data were excluded from the specific analysis in which the data were missing. Outliers were retained given their clinical relevance in suicide risk assessment. All analyses were conducted using SAS (version 9.4) and statistical significance was set at $p < 0.05$.

Results

The demographics and clinical characteristics of the current cohort have been described previously.[44] Overall, the sample included 1,405 participants, of whom 1,040 were enrolled in D2K (1,008 with a history of a mood disorder, either current or past, and 32 healthy control adults), and 365 were enrolled in RAD. Among those with a history of mood disorder, 290 participants were 24 years of age or younger. The average ages (mean ± SD) of healthy controls, D2K (>24 years), D2K (10–24 years), and RAD participants were 37.97 ± 14.31, 47.11 ± 13.74, 18.47 ± 3.83, and 16.56 ± 4.53, respectively. The total sample consisted of 64% females, and the racial and ethnic composition was as follows: 70% White, 13% Black or African American, 7% Asian, and 4% identifying as more than one race, with 18% identifying as Hispanic.

A total of 92 participants endorsed moderate or severe suicidal ideation on the PHQ-9 suicide item (a response of "2" or "3"), all of whom were in the D2K cohort, and reported a current or past mood disorder. The mean CHRT-SR_9 total score was significantly higher for individuals with a history of mood disorder than for those at risk and healthy controls (Table 2). Twenty-nine participants did not complete the CHRT-Beh assessment. Healthy controls reported no suicidal ideation, attempt, or self-injurious behavior in the past week. Within the D2K cohort with a history of mood disorder, 14.07% of adults (>24 years) and 13.45% of youths (10–24 years) endorsed suicidal ideation in the past week. Suicide attempt rates were low, with 0.14% of adults and 0.34% of youths in the mood disorder cohort reporting a suicide

Table 2 PHQ-9, CHRT-SR_9, and CHRT-Beh Data of Participants in RAD and D2K

Characteristics/Clinical Measure	T-RAD (n = 1405)	D2K			RAD (n = 365)
		HC (n = 32)	Depressed or History of Depression		
			D2K (>24 yrs.) (n = 718)	D2K (10–24 yrs.) (n = 290)	
PHQ-9					
PHQ-9 (Mean ± SD)	8.17 ± 6.79	0.79 ± 0.92	10.95 ± 6.49	9.73 ± 6.12	2.19 ± 2.65
PHQ-9 Categories, n (%)					
None (0–4)	515 (36.65)	32 (100)	119 (16.57)	63 (21.72)	301 (82.47)
Mild (5–9)	349 (24.84)	0 (0)	207 (28.83)	84 (28.97)	58 (15.89)
Moderate (10–14)	249 (17.72)	0 (0)	178 (24.79)	67 (23.1)	4 (1.1)
Moderate Severe (15–19)	174 (12.38)	0 (0)	127 (17.69)	46 (15.86)	1 (0.27)
Severe (20–27)	100 (7.12)	0 (0)	79 (11)	21 (7.24)	0 (0)
Unknown	18 (1.28)	0 (0)	8 (1.11)	9 (3.1)	1 (0.27)
PHQ-9 Suicidality item, n (%)					
0	1113 (79.22)	32 (100)	522 (72.7)	204 (70.34)	355 (97.26)
1	181 (12.88)	0 (0)	122 (16.99)	50 (17.24)	9 (2.47)
2	51 (3.63)	0 (0)	37 (5.15)	14 (4.83)	0 (0)
3	41 (2.92)	0 (0)	28 (3.9)	13 (4.48)	0 (0)
Unknown	19 (1.35)	0 (0)	9 (1.25)	9 (3.1)	1 (0.27)

(*Continued*)

Table 2 (Continued).

Characteristics/Clinical Measure	T-RAD (n = 1405)	D2K			RAD (n = 365)
		HC (n = 32)	Depressed or History of Depression		
			D2K (>24 yrs.) (n = 718)	D2K (10–24 yrs.) (n = 290)	
CHRT-SR$_9$					
Total Score, (Mean ± SD)	6.84 ± 7.2	1.17 ± 2.24	8.94 ± 7.36	8.31 ± 7.32	2.41 ± 4.28
Pessimism, (Mean ± SD)	2.21 ± 2.18	0.48 ± 0.87	3.04 ± 2.23	2.33 ± 2.05	0.75 ± 1.23
Helplessness, (Mean ± SD)	2.32 ± 2.3	0.38 ± 0.78	2.94 ± 2.29	2.93 ± 2.38	0.92 ± 1.5
Despair, (Mean ± SD)	1.35 ± 1.99	0.14 ± 0.52	1.74 ± 2.17	1.8 ± 2.12	0.39 ± 1.03
Suicidal Thoughts, (Mean ± SD)	0.96 ± 2.18	0.17 ± 0.6	1.23 ± 2.5	1.24 ± 2.22	0.35 ± 1.27
CHRT-SR$_9$ Severity, n (%)					
None (0–14)	1010 (71.89)	29 (90.63)	476 (66.3)	186 (64.14)	319 (87.4)
Mild (15–21)	117 (8.33)	0 (0)	79 (11)	36 (12.41)	2 (0.55)
Moderate (22–26)	36 (2.56)	0 (0)	31 (4.32)	3 (1.03)	2 (0.55)
Severe (27–36)	24 (1.71)	0 (0)	15 (2.09)	7 (2.41)	2 (0.55)
Missing	218 (15.52)	3 (9.38)	117 (16.3)	58 (20)	40 (10.96)
CHRT-Beh					
Suicide Ideation – past week, n (%)	n=1405	n=32	n=718	n=290	n=365
No	1230 (87.54)	32 (100)	594 (82.73)	247 (85.17)	357 (97.81)
Yes	146 (10.39)	0 (0)	101 (14.07)	39 (13.45)	6 (1.64)
Missing	29 (2.06)	0 (0)	23 (3.2)	4 (1.38)	2 (0.55)
Suicide Attempt – past week, n (%)					
No	1374 (97.79)	32 (100)	694 (96.66)	285 (98.28)	363 (99.45)
Yes	2 (0.14)	0 (0)	1 (0.14)	1 (0.34)	0 (0)
Missing	29 (2.06)	0 (0)	23 (3.2)	4 (1.38)	2 (0.55)
Non-Suicidal Self-injury (NSSI) – past week, n (%)					
No	1360 (96.8)	32 (100)	687 (95.68)	278 (95.86)	363 (99.45)
Yes	15 (1.07)	0 (0)	8 (1.11)	7 (2.41)	0 (0)
Missing	30 (2.14)	0 (0)	23 (3.2)	5 (1.72)	2 (0.55)
Preparatory Acts – past week, n (%)					
No	1371 (97.58)	32 (100)	692 (96.38)	284 (97.93)	363 (99.45)
Yes	1 (0.07)	0 (0)	1 (0.14)	0 (0)	0 (0)
Missing	33 (2.35)	0 (0)	25 (3.48)	6 (2.07)	2 (0.55)
Completed Suicide – past week, n (%)					
No	1375 (97.86)	32 (100)	694 (96.66)	286 (98.62)	363 (99.45)
Yes	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Missing	30 (2.14)	0 (0)	24 (3.34)	4 (1.38)	2 (0.55)

(*Continued*)

Table 2 (Continued).

Characteristics/Clinical Measure	T-RAD (n = 1405)	D2K			RAD (n = 365)
		HC (n = 32)	Depressed or History of Depression		
			D2K (>24 yrs.) (n = 718)	D2K (10–24 yrs.) (n = 290)	
Self-injurious Behavior- Unknown Intent – past week, n (%)					
No	1372 (97.65)	32 (100)	692 (96.38)	285 (98.28)	363 (99.45)
Yes	3 (0.21)	0 (0)	2 (0.28)	1 (0.34)	0 (0)
Missing	30 (2.14)	0 (0)	24 (3.34)	4 (1.38)	2 (0.55)
Death (not enough information to classify as suicide) – past week, n (%)					
No	1374 (97.79)	32 (100)	693 (96.52)	286 (98.62)	363 (99.45)
Yes	1 (0.07)	0 (0)	1 (0.14)	0 (0)	0 (0)
Missing	30 (2.14)	0 (0)	24 (3.34)	4 (1.38)	2 (0.55)
Other injury - Other not purposeful injury – past week, n (%)					
No	1339 (95.3)	32 (100)	673 (93.73)	279 (96.21)	355 (97.26)
Yes	37 (2.63)	0 (0)	22 (3.06)	7 (2.41)	8 (2.19)
Missing	29 (2.06)	0 (0)	23 (3.2)	4 (1.38)	2 (0.55)
Nonfatal injury (not enough information to classify) – past week, n (%)					
No	1372 (97.65)	32 (100)	694 (96.66)	285 (98.28)	361 (98.9)
Yes	4 (0.28)	0 (0)	2 (0.28)	1 (0.34)	1 (0.27)
Missing	29 (2.06)	0 (0)	22 (3.06)	4 (1.38)	3 (0.82)

Abbreviations: PHQ-9, Patient Health Questionnaire – 9; CHRT-SR_9, Concise Health Risk Tracking - Self-Report; CHRT-Beh, Concise Health Risk Tracking – Behavior; HC, Healthy Control group; T-RAD, Texas Resilience Against Depression.

Table 3 CHRT-SR_9 Scores of Those Endorsing Suicidal Ideation on the CHRT-Beh

Variable	CHRT-Beh Suicide Ideation - No	CHRT-Beh Suicide Ideation - Yes	Effect Size, Cohen's d	p-value
$CHRTSR_9$ Total Score (Mean ± SD)	5.61±6.16	17.10±7.37	1.82	<0.0001
$CHRTSR_9$ Ideation Subscale (Mean ± SD)	0.61±1.73	4.03±3.12	1.77	<0.0001

attempt. Non-suicidal self-injury (NSSI) was reported by 1.11% of adults and 2.41% of youths in the mood disorder cohort. Among participants in the RAD cohort, 1.64% reported suicidal ideation in the past week.

Participants who endorsed suicidal ideation on the CHRT-Beh had significantly higher CHRT-SR_9 total scores (d=1.82, p<0.0001, Table 3) and higher CHRT-SR_9 suicidal ideation subscale scores (d=1.77, p<0.0001, Table 3) compared to those who did not report suicidal ideation on CHRT-Beh.

Discussion

The current report describes the CHRT-Beh module and its application, in conjunction with the CHRT-SR_9, in a large observational study evaluating suicidality in the past week. The CHRT package, comprising the self-report CHRT-SR_9 and the clinician-rated CHRT-Beh, provides a comprehensive evaluation of a patient's overall suicidality. T-RAD study participants who reported suicidal ideation during the CHRT-Beh clinician interview exhibited an increased risk for

suicidality, as captured by CHRT-SR_9. The CHRT-Beh also captured suicidal attempts in a subset of participants. Most people with suicidal ideation do not actually attempt to end their lives.[47] In fact, risk in the context of suicidality comes from thinking and planning that may or may not be expressed as behavior. The self-report CHRT-SR_9 allows for the prospective tracking of changes in suicidal risk and has been shown to have predictive validity for future suicidal behaviors.[28,37] The clinician-rated CHRT-Beh, on the other hand, allows for a retrospective investigation of the occurrence of suicidal thinking and behavior to comprehensively categorize them according to the FDA-mandated C-CASA criteria.

While the C-SSRS and the Sheehan-Suicidality Tracking Scale[48] are well-known suicidality rating scales that are widely used in clinical trials to assess suicidal ideation and behavior, they do not capture factors associated with suicidal risk and propensity, such as pessimism, helplessness, and despair, which are measured by the CHRT-SR_9. Additionally, CHRT-SR_9 provides value by assessing constructs that have been associated with subsequent suicidal behavior. Capturing these psychological constructs adds value because these factors often precede observable suicidal behaviors. Although the C-SSRS provides ideation/behavior degrees and the Sheehan-STS is effective for repeated tracking, neither tool offers a composite assessment of risk propensity and behavior classification in a way that is directly in line with regulatory requirements. Our findings extend the usefulness of these known instruments and build on previous research by showing that a dual CHRT administration captures behavioral manifestations of suicidality as well as psychological precursors.

The dual use of CHRT-SR_9 and CHRT-Beh has significant research and clinical implications, especially in screening large populations for suicidality. Current guidelines mandate suicidality screening for individuals over 12 years of age getting treatment for behavioral health problems.[49] The US Preventive Services Task Force recommends suicidality screening in primary care environments for both adults[50] and adolescents.[51] Though the CHRT-Beh primarily classifies events that occurred in the past week, the wording on questions can be adjusted to allow for assessment of suicidality over any timeframe (including total lifetime). This flexibility allows the measure to be tailored for various research and clinical purposes.

Proposal for Dual Administration of the CHRT-SR_9 and CHRT-Beh in Clinical Trials

We propose the dual administration of CHRT-SR_9 and CHRT-Beh in clinical trials as a strategic means of assessing both suicidal risk and past suicidal behavior. The CHRT-SR_9 was designed to assess the waxing and waning of suicidal thinking, which is assumed to contribute to the risk of suicidal behaviors. In that sense, the CHRT-SR_9 is prospective and may indicate suicidal propensity that has not necessarily yet been expressed as behavior. So, although CHRT-SR_9 captures an individual's risk of suicidality in the past week, by administering it at every clinical encounter, we can capture prospective changes in risk over time. Trial protocols can outline processes for responding to suicide risk as indicated by the CHRT-SR_9 total score, which ranges from 0–36, with higher numbers indicating greater risk. For example, a total score higher than 22 on the CHRT-SR_9 is considered "moderate to severe" and may warrant a response from the clinical team to assess and intervene as needed.[40] Once CHRT-SR_9 has identified a potential risk, CHRT-Beh can then be completed to systematically document suicidal ideation and behaviors that have occurred. This procedure guarantees a systematic categorization of previous occurrences and records symptoms that could impact the course of treatment and continuous risk assessment. It goes without saying that CHRT-SR_9 and the CHRT-Beh should be used in combination with the assessment of specific patient factors (eg, reasons for living, impulsivity, co-morbid medical and psychiatric conditions), contextual factors (eg, access to social support, major life stressors/ traumatic stressors), and system of care factors (eg, availability of the provider between visits, access to higher levels of care) for all patient-specific treatment strategies. Complex clinical variables affect the likelihood of thinking about suicide, as well as whether the patient acts on those suicidal impulses or thoughts. It is critical for clinicians and researchers to have protocols in place for safety planning and referrals to appropriate levels of care should concerns arise about potential suicidal/safety risks.

Proposal for Dual Administration of the CHRT-SR_9 and CHRT-Beh in Clinical Practice

While the CHRT-SR and Beh scales were developed primarily for research purposes, these can easily be implemented in clinical practice in which CHRT-SR_9 could be used as a screening tool, followed by the CHRT-Beh assessment for patients who screen positive for suicidal risk (eg, a total score higher than 20 on the CHRT-SR_9 is considered "moderate to severe" or who indicate positive suicidal ideation on the last three items). Administration of the CHRT-

SR_9 provides the clinician with an easy-to-administer self-report scale exploring suicidal thoughts, as well as the other factors associated with suicidal risk. Administering an assessment of suicidal thoughts also addresses the recommendation to conduct universal screening of suicidality for all youth ages 12 years and older.[52] In many cases, the youth will not report suicidal risk, and in these situations, no further assessment is needed. For youth reporting suicidal thoughts or high levels of risk, the clinician would then complete the CHRT-Beh assessment to further determine the patient's risk, thereby improving the plan of care for the patient. Additionally, reviewing the CHRT-SR_9 before the CHRT-Beh can allow clinicians the opportunity to clarify situations where a patient verbally denies suicidal ideation but endorsed ideation on the CHRT-SR_9. This dual administration of the CHRT thereby can reduce the burden on patients and clinical staff to streamline assessment to target patients who warrant additional suicidality assessment and track their suicidal behaviors over time to inform clinical care. There may, however, be logistical obstacles during clinical implementation, such as clinician time constraints, training requirements, and integration with electronic health records. Although our center's preliminary qualitative feedback indicates that clinicians value CHRT-Beh's simplified structure, more comprehensive empirical data on acceptance, completion time, and practicality are important to consider in future work.

Strengths and Limitations

The CHRT-SR_9 is a well-established measure of suicidal risk in adolescent and adult populations. The companion CHRT-Beh documents past events and aligns with the C-CASA classifications. Using both the CHRT-SR_9 and the CHRT-Beh allows for a comprehensive assessment of patients' suicidal risk. Administering both measures simultaneously may limit inconsistencies. Though detailed clinical interviews are important for gathering a psychiatric history, and are recommended for satisfying FDA requirements, past work has shown discordance between self-report and clinician judgment in predicting suicidal ideation and later suicide attempts; in such cases, self-report has been suggested to be more sensitive.[53,54] The use of both types of measures is likely to yield the best results. Importantly, the CHRT-Beh allows for the classification of suicidal behavior into the C-CASA domains. These classifications may have utility for safety planning and treatment purposes,[55] and are approved by the FDA for all trials of drugs that act on the central nervous system.[16,56] The dual package of the CHRT-SR_9 and the CHRT-Beh also allows systematic collection of information across providers, which may allow researchers to compare treatments with more ease in comparative trials.

There are limitations to the current report. The T-RAD study excluded participants at risk for hospitalization for high suicide risk at the time of consent, which likely led to the fact that there were very few participants reporting a suicide attempt within the past week during the baseline visit. As such, the low rate of past week suicide attempts may reduce the generalizability to populations at higher risk for suicide. While the CHRT-SR_9 has demonstrated the ability to predict suicidal events in acutely depressed adolescents at least as well as the C-SSRS,[37] data supporting the concurrent utility of the CHRT-Beh has not yet been published. Challenges in longitudinal studies with a large cohort include attrition and variable attendance at in-person visits. Although the introduction of monthly virtual surveys partially alleviated these issues, CHRT-Beh requires clinician assessment, and missing data was still evident. Further evaluation of the CHRT package in ongoing longitudinal studies, such as the Texas Youth Depression and Suicide Research Network[57] and the T-RAD Study[43] will establish its efficacy. In addition, further investigations are necessary to assess the acceptability and feasibility of the CHRT-Beh in clinical workflow. Finally, because the T-RAD study is an observational study and the study team was not responsible for implementing interventions, we are unable to report on how the dual administration of the CHRT may impact treatment decisions. Future examination of the dual administration of the CHRT in clinical trials may provide further information on the impact of the CHRT measures on treatment decisions.

Conclusions

This study is the first to illustrate the complementary utility of CHRT-SR_9 and CHRT-Beh, which capture both clinician-classified suicidal behaviors and psychological risk factors, within the same assessment window. In summary, the CHRT package of CHRT-SR_9 and the CHRT-Beh collectively offer a structured methodology for assessing patients' overall suicidality. The dual system not only meets the requirements of regulatory bodies for use in interventional clinical trials but also provides clinically relevant information to inform patient care. The CHRT package, integrating self-report and

clinician-rated instruments, will help capture overall suicidal risk, enable comprehensive follow-up screening, and implement early interventions as needed. It facilitates both the prospective assessment of suicidal risk and the retrospective categorization of suicidal behavior and thoughts. We believe the combination of the CHRT-SR_9 and the CHRT-Beh can be optimal for clinical trials and routine suicidality assessments in healthcare settings. The validation of predictive outcomes and the development of more comprehensive clinical applications are directions for future research.

Data Sharing Statement

The data is available upon request from the corresponding author, Dr. Madhukar H. Trivedi.

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Author Contributions

All authors contributed significantly to the work reported, whether in the conception, study design, execution, acquisition of data, analysis, and interpretation, or all these areas. All authors took part in drafting, revising, or critically reviewing the article, approved the final version to be published, agreed on the journal to which the article has been submitted, and agreed to be accountable for all aspects of the work.

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Disclosure

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