

Factors Associated With Suicide Outcomes 12 Months After Screening Positive for Suicide Risk in the Emergency Department

Sarah A. Arias, Ph.D., Ivan Miller, Ph.D., Carlos A. Camargo, Jr., M.D., Dr.P.H., Ashley F. Sullivan, M.S., M.P.H., Amy B. Goldstein, Ph.D., Michael H. Allen, M.D., Anne P. Manton, Ph.D., A.P.R.N., Edwin D. Boudreaux, Ph.D.

Objective: The main objective was to identify which patient characteristics have the strongest association with suicide outcomes in the 12 months after an index emergency department (ED) visit.

Methods: Data were analyzed from the first two phases of the Emergency Department Safety Assessment and Follow-up Evaluation (ED-SAFE). The ED-SAFE study, a quasi-experimental, interrupted time-series design, involved participation from eight general medical EDs across the United States. Participants included adults presenting to the ED with active suicidal ideation or an attempt in the past week. Data collection included baseline interview; six- and 12-month chart reviews; and six-, 12-, 24-, 36-, and 52-week telephone follow-up assessments. Regression analyses were conducted.

Results: Among 874 participants, the median age was 37 years (interquartile range 27–47), with 56% of the sample

being female (N=488), 74% white (N=649), and 13% Hispanic (N=113). At baseline, 577 (66%) participants had suicidal ideation only, whereas 297 (34%) had a suicide attempt in the past week. Data sufficient to determine outcomes were available for 782 (90%). In the 12 months after the index ED visit, 195 (25%) had documentation of at least one suicide attempt or suicide. High school education or less, an ED visit in the preceding six months, prior nonsuicidal self-injury, current alcohol misuse, and suicidal intent or plan were predictive of future suicidal behavior.

Conclusions: Continuing to build an understanding of the factors associated with future suicidal behaviors for this population will help guide design and implementation of improved suicide screening and interventions in the ED and better allocation of scarce resources.

Psychiatric Services 2016; 67:206–213; doi: 10.1176/appi.ps.201400513

With an average of more than 420,000 individuals presenting annually to the emergency department (ED) for suicide and self-injury-related visits, identifying factors associated with suicide risk for these patients is critical (1). A variety of factors are associated with suicidal behavior of adults identified as being at risk of suicide, including demographic characteristics (2), psychiatric disorders (2,3), substance use disorders, and social problems (such as having a poor maternal relationship [3]). However, there is limited research on risk factors associated with the ED population, specifically whether and how these factors change in the year after the initial ED visit.

This study was conducted to add to the existing literature by confirming or establishing associations of psychiatric and nonpsychiatric risk factors found in the patient's medical record with future suicide outcomes for ED patients endorsing thoughts of and a plan for suicide (active suicidal ideation) or suicidal behavior during the initial ED visit. From a clinical standpoint, this type of information is critical

for determining which patients will require additional resources to mitigate risk and, ultimately, to prevent suicidal behavior.

METHODS

The Emergency Department Safety Assessment and Follow-Up Evaluation (ED-SAFE) was a quasi-experimental, eight-center study designed to test an approach to universal screening for suicide risk and postvisit telephone intervention among ED patients (4). ED-SAFE consisted of three phases of data collection: treatment as usual (phase 1), universal screening (phase 2), and universal screening and use of an intervention (phase 3). ED-SAFE was conducted from August 2, 2010, through November 8, 2013. Our study analyzed data from the first two phases of ED-SAFE because no study-related interventions for suicidal patients were implemented in these phases, thus maximizing the applicability of our study findings to general U.S. EDs.

ED-SAFE participants were selected by first determining whether the individual's chart documented any screening for self-harm ideation or behavior. If documentation indicated positive self-harm (self-harm ideation or behavior was documented as present), the patient was approached for further eligibility screening. If the patient confirmed either active suicidal ideation or a suicide attempt within the past week and agreed to participate, then he or she went through the consent process and enrolled in the ED-SAFE study.

The participants completed a baseline assessment and were then followed postdischarge (from ED or from inpatient services, if admitted) with a multimethod approach involving telephone assessments and chart reviews. After the index ED visit, each participant was telephoned by a trained interviewer at 6, 12, 24, 36, and 52 weeks for an outcome assessment. In addition, chart reviews were conducted by a trained chart abstractor at the site at six and 12 months. The first three chart reviews were independently reviewed by the site principal investigator for accuracy. For the major predictor variables, kappas between the research assistant and the site principal investigator were very strong, ranging from .96 to 1.00.

Institutional review boards at each site approved all study procedures and protocols; overall study oversight and monitoring were conducted by the National Institute of Mental Health Data and Safety Monitoring Board.

Measures

Sociodemographic characteristics. Patient characteristics collected during baseline interviews included general demographic characteristics such as age, sex, race, ethnicity, sexual orientation, and marital status, along with components of socioeconomic status (including education and employment). Patients also were asked whether they had a primary care provider, whether they lived alone, whether a loved one had died in the past three months, and whether they were a member of the armed services.

General health. At the index ED visit, patients responded yes or no to "In the past 12 months, have you had any of the following health problems?" Problems listed were diagnosis of heart disease/heart attack, cancer, HIV, diabetes, stroke, and chronic pain. Quality of life was measured with the six-item Short-Form Health Survey (SF-6D), which focuses on physical functioning, role participation, social functioning, bodily pain, mental health, and vitality (5).

Mental health. At the index ED visit, patients responded yes or no to the stem "Have you ever been diagnosed by a doctor or therapist with. . .," where responses were depression, bipolar disorder, alcohol abuse, drug abuse, anxiety, attention-deficit hyperactivity disorder, eating disorder, schizophrenia, or other psychiatric problems. Psychiatric diagnoses were indicated by ICD-9 codes (290–319) collected during chart review. A yes-no item concerning interpersonal violence asked, "In the past 30 days (including today), have you been hit, kicked punched, or otherwise hurt by someone?"

TABLE 1. Suicide composite outcome responses of 874 participants in the Emergency Department Safety Assessment and Follow-up Evaluation

Category	N	%
Participants with completed chart reviews	874	100
Participants completing ≥ 1 telephone follow-up	707	81
Participants completing all 5 telephone follow-ups	405	46
Participants with events qualifying as outcome data (from either chart review or telephone follow-up assessment)	782	90
Traditionally reported outcome	195	100
Suicide attempt	193	99
Suicide	2	1
Expanded outcome (multiple categories possible)	430	55
Preparatory acts	237	30
Aborted attempt	311	40
Interrupted attempt	255	33
Suicide attempt	193	25
Suicide completion	2	<1
Overall suicide composite outcome (participant counted for only his or her most severe category ^a)		
Preparatory acts	23	5
Aborted attempt	71	17
Interrupted attempt	141	33
Suicide attempt	193	45
Suicide	2	<1

^a There were 16 deaths, 2 of which were clearly intentional; for 5 deaths, intentionality could not be determined because of insufficient information, and 9 deaths were clearly not intentional. Categories were ordered by severity of suicidal behavior. Participants with multiple outcome responses (for example, yes for preparatory act and yes for suicide attempt) were categorized into the most severe category (in this case, suicide attempt).

The Brief Symptom Inventory-18 (BSI-18) was included for measures of somatization, depression, anxiety, and an overview of patient symptoms and intensity (Global Severity Index) (6). These four scales have shown good internal consistency, test-retest reliability, validity, and sensitivity (7).

Health care utilization. Measures of health care utilization in the six months prior to the index ED visit (yes-no response) included indicators of hospitalization for psychological or emotional problems and whether the patient visited the ED.

Treatment received. Receipt of a mental health evaluation during the index ED visit (yes-no) and hospital admission (yes-no) also were analyzed.

Substance use. Drug use was defined by a yes response to the question "Over the past 12 months, have you used drugs other than those required for medical reasons?" Current drug use also was examined by a yes for "intentional illegal or prescription drug misuse" or a yes for "any positive urine tox screen" during the index ED visit.

TABLE 2. Unadjusted factors associated with 12-month suicide outcomes after an index emergency department visit for suicide attempt or ideation (N=782)

Variable	Traditional outcome ^a			Expanded outcome ^b		
	OR	95% CI	p	OR	95% CI	p
Demographic						
Age	1.00	.99–1.01	.84	1.01	.99–1.02	.03
Female (reference: male)	1.18	.85–1.64	.32	1.47	1.10–1.95	.008
White (reference: nonwhite)	1.02	.70–1.50	.90	1.25	.94–1.67	.13
Hispanic (reference: non-Hispanic)	.79	.47–1.34	.38	.93	.60–1.43	.73
Gay, lesbian, or bisexual (reference: heterosexual)	1.32	.82–2.10	.25	1.34	.87–2.07	.19
Married (reference: not married)	.88	.58–1.34	.54	.93	.65–1.32	.67
Lives alone (reference: cohabiting)	1.20	.84–1.71	.32	1.17	.85–1.61	.33
Death of a loved one in past 3 months (reference: no)	.71	.46–1.09	.11	.94	.66–1.33	.71
Served in the military (reference: no)	1.15	.61–2.17	.68	1.55	.86–2.80	.15
Education: high school graduate or lower (reference: some higher education)	1.46	1.05–2.03	.02	1.55	1.17–2.06	.002
Has a primary care provider (reference: no)	1.23	.86–1.75	.26	1.40	1.03–1.89	.03
Has insurance coverage (reference: no)	1.24	.85–1.80	.26	1.12	.81–1.54	.50
Unemployed (reference: employed)	1.56	1.06–2.30	.02	1.87	1.36–2.57	<.001
General health condition						
1 or more chronic health conditions (reference: no condition)	1.01	.70–1.45	.96	1.74	1.27–2.38	.001
Heart disease or heart attack	1.31	.72–2.36	.38	1.45	.83–2.53	.19
Cancer	1.00	.36–2.80	.99	1.55	.61–3.91	.36
HIV	.69	.20–2.45	.57	1.83	.63–5.32	.27
Diabetes	1.49	.93–2.37	.097	1.89	1.19–2.99	.007
Stroke	1.00	.20–5.01	.99	1.38	.33–5.80	.66
Chronic pain	.99	.70–1.40	.94	1.56	1.15–2.10	.004
Brief Symptom Inventory						
Depression subscale	1.02	.98–1.06	.28	1.06	1.03–1.10	<.001
Anxiety subscale	1.01	.99–1.04	.35	1.02	1.00–1.04	.12
Somatization subscale	1.04	1.01–1.07	.009	1.04	1.01–1.07	.002
Global Severity Index	1.01	1.00–1.02	.07	1.02	1.01–1.03	.001
Quality of life (SF-6D) ^c	1.01	.94–1.08	.76	.93	.88–.99	.02
Mental health history (reference: no history of problems)						
Mental health problems (combined)	4.20	1.79–9.82	.001	2.85	1.72–4.73	<.001
Depression	3.45	1.90–6.27	<.001	3.01	2.02–4.50	<.001
Bipolar disorder	1.85	1.33–2.56	<.001	1.56	1.17–2.08	.002
Anxiety	2.02	1.41–2.90	<.001	1.90	1.43–2.56	<.001
ADHD	1.18	.81–1.71	.39	.99	.71–1.39	.97
Eating disorder	1.78	1.14–2.79	.01	1.67	1.07–2.59	.02
Schizophrenia	1.48	.91–2.39	.11	1.68	1.06–2.68	.03
Other psychiatric problems	1.62	1.13–2.32	.009	1.45	1.04–2.03	.03
Interpersonal violence (reference: no)	.78	.45–1.35	.38	.94	.60–1.48	.80
Health care utilization (reference: no)						
Hospitalized for psychological or emotional problems within past 6 months	3.02	2.01–4.52	<.001	2.43	1.79–3.29	<.001
Emergency department visit within past 6 months	2.49	1.73–3.57	<.001	1.99	1.49–2.66	<.001
Treatment received (reference: no)						
Mental health evaluation	.65	.41–1.05	.08	.69	.44–1.08	.11
Hospital admission (any)	.98	.94–1.03	.42	.99	.96–1.03	.62
Hospital admission (psychiatric)	1.27	.92–1.77	.15	1.23	.93–1.63	.16
Substance use (reference: no abuse)						
Drug abuse (past)	1.40	.93–2.08	.11	1.59	1.09–2.32	.01
Drug use (current)	.99	.72–1.37	.97	.93	.70–1.23	.59

continued

Alcohol misuse (past year) was assessed by calculating a score based on responses to “How often do you have a drink containing alcohol?” “How many drinks containing alcohol do you have on a typical day when you are drinking?” and “How often do you have four or more drinks on one occasion?” For men and women under age 65, a total score of 8 or more and for men and women over age 65 a score of 7 or more were considered indicators of harmful or hazardous alcohol use (8).

Suicide-related indicators. To examine suicidal ideation severity, suicidal ideation intensity, and suicide attempt severity, scores were derived from responses to items from the Columbia Suicide Severity Rating Scale (C-SSRS [9]). The C-SSRS has been validated in the context of three multisite studies, including a study of adults presenting for psychiatric reasons to an ED (10).

Additional suicide-related items (all yes-no responses) collected at baseline included lifetime preparatory acts, lifetime interrupted attempts, lifetime aborted attempts, history of nonsuicidal self-injury, presence of lethal means, and history of suicide attempts.

Outcome

The primary outcome was the traditionally reported suicidal outcome—that is, a suicide composite comprising suicide attempts (yes-no) or suicides (yes-no). An event was labeled as a suicide attempt if it was a potentially self-injurious behavior associated with at least some intent to die as a result of the act. Documentation of

these outcomes at any of the follow-up assessment time points (telephone follow-up or chart review) counted as a yes for the traditionally reported outcome.

Research has identified preparatory acts, as well as interrupted and aborted suicide attempts as significant predictors of suicide outcomes. Therefore, to generate preliminary empirical evidence for how these variables affect findings when included as part of the suicide outcome (11), the traditionally reported outcome measure was expanded to include preparatory acts (yes-no) and aborted and interrupted attempts (yes-no).

Data Analysis

All analyses were conducted with Stata 13.1 and were unadjusted. All variables with an association $p \leq .10$ (two-tailed) were included in a multivariable logistic regression. Odds ratios (ORs) were reported with 95% confidence intervals (CIs). In the final model, $p < .05$ was considered statistically significant. To account for commonly recognized sociodemographic differences, age, sex, race, and ethnicity were included in the multivariable model regardless of statistical significance in initial unadjusted testing. With power calculations using a significance (alpha) level of .05 and our sample size of 874, our analyses had sufficient power to detect a small effect size (Cohen's $d = .12$).

RESULTS

In the sample of 874 participants, the median age was 37 years (interquartile range 27–47) 56% ($N = 488$) were female, 74% ($N = 649$) were white, and 13% ($N = 113$) were Hispanic. At baseline, 577 (66%, CI=62%–70%) reported suicidal ideation alone, whereas 297 (34%, CI=29%–40%) reported a suicide attempt in the past week. Of the 297 with a suicide attempt in the past week, 227 (76%) presented to the ED as a result of a suicide attempt; the remaining presented with suicide-related complaints ($N = 28$, 9%), mood disorders ($N = 3$, 1%), substance use ($N = 2$, 1%), concerns for non-suicidal self-harm ($N = 1$, <1%), or general medical issues (such as chest pain, $N = 8$, 3%) or were missing data on the presenting complaint ($N = 28$, 9%).

TABLE 2, continued

Variable	Traditional outcome ^a			Expanded outcome ^b		
	OR	95% CI	p	OR	95% CI	p
Intentional illegal or prescription drug misuse (current emergency department visit)	.84	.59–1.20	.34	.86	.63–1.18	.35
Positive toxicology screen (current emergency department visit)	1.31	.92–1.87	.14	1.36	1.00–1.85	.049
Alcohol abuse (past)	1.14	.77–1.69	.53	1.30	.91–1.85	.14
Alcohol misuse (current)	1.40	1.00–1.96	.053	1.13	.84–1.53	.43
Suicide-related measure						
Columbia Suicide Severity Rating Scale						
Suicidal ideation severity (current)	1.39	1.15–1.67	.001	1.44	1.24–1.67	<.001
Suicidal ideation severity (lifetime)	1.12	1.05–1.20	.001	1.12	1.06–1.19	<.001
Suicidal ideation intensity	1.01	.97–1.06	.52	1.06	1.02–1.10	.002
Suicide attempt severity	.99	.77–1.28	.93	1.20	.93–1.56	.16
Lethal means available (reference: no)	.83	.32–2.15	.86	1.23	.52–2.89	.64
Engaged in preparatory acts (lifetime) (reference: no)	1.26	.90–1.75	.17	1.52	1.14–2.02	.004
At least one interrupted attempt (lifetime) (reference: no)	1.48	1.06–2.08	.02	1.54	1.16–2.06	.003
At least one aborted attempt (lifetime) (reference: no attempt)	1.28	.91–1.80	.16	1.80	1.34–2.42	<.001
History of nonsuicidal self-injury (reference: no)	1.59	1.15–2.21	.005	1.44	1.08–1.91	.01
History of suicide attempts (reference: no)	2.44	1.62–3.69	<.001	2.30	1.68–3.15	<.001

^a Suicide attempt or suicide

^b Preparatory act, interrupted attempt, aborted attempt, suicide attempt, and suicide

^c Measured with the 6-Item Short Form Health Survey

There were 782 participants (90%) with data available at any of the follow-up assessment time points to determine whether the participant experienced one of the constituents of the traditionally reported suicide outcome. Of those 782 individuals, all of them were followed through chart review, 707 completed at least one of the five telephone follow-up assessments, and 405 completed all of the telephone follow-up assessments. Of the 782 participants, 264 (34%) screened positive for current suicidal ideation or behavior, of which 239 (91%) received a mental health evaluation at the index ED visit. In the 12 months after the index ED visit, 195 (25%) had documentation of at least one suicide attempt or suicide (Table 1).

Sociodemographic Characteristics

Unadjusted analyses (Table 2) indicated that individuals with a high school education or less and those who were unemployed were more likely than others to have a suicide outcome in the 12 months after the index ED visit.

General Health

Individuals diagnosed as having diabetes had the strongest association with the suicide outcome.

Mental Health

Reporting a history of at least one mental health problem was associated with the suicide outcome, as were specific

TABLE 3. Multivariable regression results for factors associated with 12-month suicide outcomes after an index emergency department visit for suicide attempt or ideation (N=745)

Variable	Traditional outcome ^a			Expanded outcome ^b		
	OR	95% CI	p	OR	95% CI	p
Demographic						
≥60 years of age (reference: <60)	.78	.53–1.16	.21	1.09	.74–1.61	.67
Female (reference: male)	1.08	.73–1.60	.70	1.34	.91–1.95	.14
White (reference: nonwhite)	.91	.59–1.40	.66	.89	.58–1.36	.59
Hispanic (reference: non-Hispanic)	.72	.40–1.30	.28	.91	.52–1.59	.74
High school education or less (reference: some higher education)	1.45	1.00–2.11	.049	1.83	1.25–2.68	.002
Unemployed (reference: employed)	1.15	.73–1.81	.55	1.53	1.00–2.33	.048
Primary care provider (reference: none)	na	na	na	1.34	.89–2.00	.16
General health condition (reference: no condition)						
1 or more chronic health conditions	na	na	na	3.39	1.16–9.90	.03
Diabetes	1.00	.99–1.00	.42	1.00	.95–1.04	.84
Chronic pain	na	na	na	.37	.13–1.06	.06
Brief Symptom Inventory somatization subscale	1.03	.99–1.06	.11	1.02	.98–1.05	.36
Quality of life (SF-6D)^c	na	na	na	.98	.90–1.06	.53
Mental health evaluation (reference: no)	.63	.37–1.08	.10	na	na	na
Mental health history (reference: no history)						
Mental health problems (combined)	1.18	.34–4.06	.80	.85	.33–2.17	.73
Depression	1.85	.78–4.39	.16	2.00	1.02–3.93	.044
Bipolar disorder	1.27	.87–1.87	.22	.98	.66–1.44	.90
Anxiety	1.12	.72–1.74	.61	1.19	.78–1.81	.42
Eating disorder	.92	.65–1.32	.66	.83	.56–1.23	.35
Schizophrenia	na	na	na	1.03	.74–1.44	.86
Other psychiatric problems	1.07	.88–1.31	.51	.90	.72–1.14	.39
Health care utilization						
Hospitalized for psychological or emotional problems	1.41	.84–2.36	.20	1.33	.83–2.13	.23
Emergency department visit within past 6 months	2.06	1.36–3.12	.001	1.51	1.04–2.19	.03
Substance use						
Positive toxicology screen	na	na	na	1.20	.83–1.74	.34
Drug abuse (past)	na	na	na	1.20	.74–1.94	.47
Alcohol misuse (current)	1.50	1.02–2.20	.04	na	na	na
Suicide-related measure						
Suicidal ideation severity (current)	1.43	1.16–1.77	.001	1.52	1.24–1.86	<.001
Suicidal ideation severity (lifetime)	1.06	.98–1.14	.17	1.06	.98–1.14	.19
Suicidal ideation intensity (current)	na	na	na	1.01	.97–1.06	.60
Preparatory acts (lifetime)	na	na	na	.90	.71–1.16	.42
Interrupted attempts (lifetime)	.99	.66–1.47	.95	.81	.54–1.20	.28
Aborted attempts (lifetime)	na	na	na	1.23	.84–1.80	.29
Nonsuicidal self-injury (lifetime)	1.51	1.03–2.22	.03	1.35	.92–1.98	.13
Suicide attempt(s) (lifetime)	1.33	.82–2.17	.25	1.25	.80–1.94	.33

^a Suicide attempt or suicide^b Preparatory act, interrupted attempt, aborted attempt, suicide attempt, and suicide^c Measured with the 6-Item Short Form Health Survey

diagnoses of depression, bipolar disorder, anxiety, and eating disorder. Suicide outcomes were associated with higher scores on the BSI somatization and Global Severity Index scales. However, because BSI scores for global severity were strongly associated with corresponding self-reported psychiatric history and the individual psychiatric history variables had stronger associations with our outcome, the self-reported psychiatric variables were included, rather than the BSI global severity scores in the multivariable model.

Mental health variables created with ICD-9 codes from chart reviews were not statistically significant.

Health Care Utilization

In the six months before the index ED visit, hospitalization for psychological or emotional problems and having at least one ED visit were each significantly associated with future suicidal behavior.

Treatment Received

Receipt of a mental health evaluation at the index ED visit was significantly associated with the suicide outcome.

Drug Use and Alcohol Misuse

Suicide outcomes were associated with alcohol misuse documented at the index ED visit.

Suicide-Related Indicators

C-SSRS scores for baseline suicide ideation severity indicated that both current and worst-ever (lifetime) scores were positively associated with future suicidal behavior. In addition, individuals reporting at least one interrupted attempt (lifetime), history of nonsuicidal self-injury, or a history of suicide attempt were significantly more likely to engage in future suicidal behavior.

Multivariable Model

For traditionally reported outcomes, participants were more likely to engage in suicidal behavior within 12 months after the index ED visit if at the index ED visit they reported that their highest level of education was high school completion or less or if they had had an ED visit within the past six months, were mis-

using alcohol, had a high C-SSRS suicidal ideation severity score (current), or had a history of nonsuicidal self-injury (Table 3).

Hosmer-Lemeshow's goodness-of-fit test revealed that the multivariable model fit well with our data ($p=.95$). No

values had variance inflation factors greater than 10, indicating low collinearity between the variables. The overall model accounted for 10% of the variance in the outcome.

Near-Term Predictors

The largest proportion of suicide outcomes occurred within six weeks of the initial ED visit (N=77 of 195, 40%) (Table 4). Predictors of six-week outcomes included BSI somatization (OR=1.09, CI=1.01–1.19, $p=.03$), ED visit within the past six months (OR=2.17, CI=1.12–4.21, $p=.02$), no current alcohol misuse (OR=.43, CI=.20–.95, $p=.04$), and current suicidal ideation with a plan and intent (OR=1.70, CI=1.18–2.44, $p=.004$).

Exploratory Expanded Outcome

After adding suicide-related preparatory acts and interrupted and aborted suicide attempts, we found that participants were more likely to have at least one suicidal outcome if at the index ED visit they reported that their highest level of education was high school completion or less, were unemployed, had a history of chronic health condition(s), had a history of depression, had an ED visit within the past six months, or had a high C-SSRS suicidal ideation severity score (current). (Table 3). The model was a reasonable fit for the data ($p=.20$).

DISCUSSION

One important goal of the ED-SAFE was to identify factors associated with future suicide risk among ED patients presenting with active suicidal ideation or behavior. In this high-risk population, outcome data were ascertained for 90% (N=782) of the cases, where 195 (25%) study participants attempted suicide or died by suicide in the 12 months after the index ED visit. Participants were more likely to have suicidal behavior if, at the index ED visit, they reported that their highest level of education was high school or less. From a health history standpoint, increased future suicidal behavior was associated with a history of nonsuicidal self-injury, current alcohol misuse, and reports of an ED visit within the past six months. Finally, individuals indicating suicidal ideation with intent or intent with a plan were more likely than others to engage in future suicidal behavior.

A large percentage of the traditionally reported outcome was reported within six weeks of the initial visit. The most notable differences between the six-week and broader time frame were that high school education or less, alcohol misuse, and a history of nonsuicidal self-injury were not predictive, but high scores on the BSI somatization measure became a significant predictor. This finding suggests that the presence of serious health issues may be important for predicting short-term suicide outcomes among ED patients. This finding also aligns with previous literature linking

chronic health conditions and functional limitations with greater suicide risk (12,13).

Although there is no established universal approach for predicting future suicidal behavior after an ED visit, this study found that current suicidal ideation severity, current alcohol misuse, and documentation of an ED visit within the past six months had a strong association with predicting suicide outcomes for ED patients presenting with suicidal ideation or behavior. However, prior suicide attempt severity and a history of mental health problems were not found to be significant predictors. As in previous research, socioeconomic factors appear to be important for assessing risk in the general population (14–16). One explanation may be that these individuals are hospitalized more frequently, which has been identified as a risk factor for suicide (17). Our findings also align with findings of Posner and colleagues (10), in that individuals with suicidal ideation with suicidal intent or stronger inclinations had higher odds of attempting suicide within 24 weeks of the initial assessment.

Our model was based on the traditionally reported outcomes of suicide attempts and suicides. However, it has been suggested that suicide outcomes include a broader range of variables, such as preparatory acts and interrupted and aborted suicide attempts. Our study briefly touched on this expanded model and determined that using it resulted in some additional predictors, including unemployment, a history of chronic health condition(s), and a history of depression. Future research on this model is needed and may benefit from comparisons to existing prediction rules, such as the ReACT self-harm rule (18).

Findings such as these are useful for meeting the demands of improved screening, interventions, treatment, and follow-up with suicidal ED patients (19). Using empirically supported variables to improve guidelines targeting patients presenting with suicide risk may help clinicians choose appropriate treatment and improve long-term suicide management for these patients.

Although several variables associated with 12-month suicide outcomes were identified, our model accounted for only 10% of the variance in the traditionally reported suicide outcome. Although this is lower than found in other studies (20), our findings provide additional support for variables

TABLE 4. Participants with a suicide-related outcome in the 12 months after an index emergency department visit for suicide attempt or ideation^a

Follow-up week	Traditional outcome		Expanded outcome		
	Suicide	Suicide attempt	Interrupted attempt	Aborted attempt	Preparatory act
6	0	77	121	155	102
12	0	56	97	113	72
24	0	61	93	126	81
36	0	46	62	94	65
52	2	53	75	78	71

^a Values represent raw counts of participants at each study time frame. Participants were counted at multiple time frames.

associated with suicide outcomes for an ED population at risk of suicide. In addition, some of the variables included in our model were readily available in the patient's medical record.

Another limitation was the small sample size for completed suicides ($N=2$). From a health standpoint, the low mortality rate is positive; however, from a statistical standpoint it does not provide enough power to draw conclusions about factors influencing completed suicides. Additional research is needed to identify risk factors for completed suicides in an ED population.

We did not directly follow patients with no suicidal ideation; however, we conducted random chart reviews to account for times when research staff were not providing coverage in the ED, and we conducted fidelity assessments to ensure that suicide screenings were being appropriately completed. Although these chart reviews did not directly track the nonsuicidal patients, they did provide a means for verifying the accuracy of the ED-SAFE data.

The large number of variables examined in this study allowed for a broad comparison of several relevant factors associated with longitudinal suicide outcomes. However, the large number of variables also limited the extent to which each variable or category of variables could be examined. The goal of this study was to identify a comprehensive group of predictors for identifying ED patients at risk of engaging in suicidal behavior. Future research may want to further delve into the individual implications for each of the findings from the larger grouping of variables.

Finally, it should be noted that some of our significant findings had odds ratios with confidence intervals close to 1.00. These findings point to clinical and statistical significance but should be interpreted cautiously. Future research is needed to replicate and confirm these findings. However, the results provide an initial framework on which to build future studies.

CONCLUSIONS

Among participants in ED-SAFE—a unique, prospectively recruited and tracked cohort of ED patients from multiple, geographically diverse sites—both psychiatric and non-psychiatric characteristics were associated with engaging in future suicidal behavior. In addition, ED-SAFE was the first study to track preparatory acts and interrupted and aborted suicide attempts over a 12-month time frame, which allowed for initial investigation into expanding the traditionally reported suicide outcome measure. The findings that individuals who did not complete high school, who had an ED visit within the past six months, who were misusing alcohol, and who had a high C-SSRS suicidal ideation severity score (current) and a history of nonsuicidal self-injury were more likely than others to attempt or complete suicide within 12 months after the index ED visit all add to the extant research on risk factors for future suicidal behavior in an adult ED population and contribute to the goal of facilitating identification of ED patients at risk of future suicidal behaviors.

AUTHOR AND ARTICLE INFORMATION

Dr. Arias and Dr. Miller are with the Department of Psychiatry and Human Behavior, Brown University, Butler Hospital, Providence, Rhode Island (e-mail: sarias@butler.org). Dr. Camargo and Ms. Sullivan are with the Department of Emergency Medicine, Massachusetts General Hospital, Boston. Dr. Goldstein is with the Division of Services and Intervention Research, National Institute of Mental Health, Bethesda, Maryland. Dr. Allen is with the University of Colorado Depression Center and Rocky Mountain Crisis Partners, Aurora. Dr. Manton is with the Center for Behavior Health Services, Cape Cod Hospital, Hyannis, Massachusetts. Dr. Boudreaux is with the Department of Emergency Medicine and Department of Psychiatry, University of Massachusetts Medical School, Worcester. This work was presented in part at the meeting of the American College of Emergency Physicians, Chicago, October 27–30, 2014.

The project described was supported by award U01MH088278 from the National Institute of Mental Health. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institute of Mental Health or the National Institutes of Health.

Dr. Allen reports receiving research support from Novartis. He reports that he has also been a contractor for Sunovion and Ferrer, an employee of ProPhase, and an advisor for Teva. The other authors report no financial relationships with commercial interests.

Received November 7, 2014; revisions received March 20 and May 6, 2015; accepted May 26, 2015; published online December 1, 2015.

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