Repeated Suicide Attempts and Suicide Among Individuals With a First Emergency Department Contact for Attempted Suicide:
A Prospective, Nationwide, Danish Register-Based Study

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ABSTRACT

Objective: Emergency departments are important, albeit underutilized, sites for suicide prevention. Preventive strategies and interventions could benefit from a greater understanding of factors influencing the course of suicide risk after emergency department contact due to attempted suicide. The aim of our study was 2-fold: to identify predictors of repeated suicide attempts and suicide and to investigate the timing of these events.

Methods: Data from Danish nationwide, longitudinal registers were used in this prospective, population-based study of all individuals first presenting to an emergency department after attempted suicide (index attempt) between January 1, 1996, and December 31, 2011 (N = 11,802). Cox regression analysis identified predictors, and Kaplan-Meier survival analysis modeled the time to repeated suicide attempts and suicide.

Results: Sixteen percent of the sample repeated suicide attempt, and 1.4% died by suicide. Repetition was less likely among men than women (adjusted hazard ratio [AHR] = 0.70; 95% CI, 0.63–0.79), whereas those most prone to repeated attempts were individuals with recent psychiatric treatment (AHR = 2.19; 95% CI, 1.97–2.43) and those with recent psychiatric treatment (AHR = 2.19; 95% CI, 1.97–2.43). Predictors of suicide included age over 35 years (AHR = 5.56; 95% CI, 2.89–10.69); hanging, strangling, or suffocation as the method of the index attempt (AHR = 2.55; 95% CI, 1.29–5.01); and receiving psychiatric hospitalization for the index attempt (AHR = 1.74; 95% CI, 1.22–2.49). The cumulative rates of repeated attempts and suicide deaths in the total sample were particularly high within the first week of the index attempt, reaching 3.6% and 0.1%, respectively.

Conclusions: Preventive efforts need to target the period close to discharge from emergency departments.

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Worldwide suicide statistics are alarming, with about 800,000 deaths estimated to occur each year.[1] Reducing the national suicide rates has therefore become part of public health policy in many countries. Since emergency departments often function as the primary or sole point of contact with organized health care after a suicide attempt, their role in preventing further attempts and suicide deaths is increasingly recognized.[2]

The development of preventive strategies and interventions requires a sound understanding of factors influencing the course of suicide risk; particularly important is information that can help to identify high-risk individuals and high-risk periods.[3] However, to date, most research on individuals who present to emergency departments after attempted suicide has been descriptive.[4–9] Only 2 studies have reported on predictors of repeated attempts,[10,11] and another 2 have examined predictors of suicide in this patient group.[12,13] With one exception,[13] previous investigations were cross-sectional or had relatively short follow-ups (2.5–5 years), often involved convenience samples from a single emergency department, and used different data collection methods (interviews, medical records, hospital databases). Thus, it is difficult to synthesize and interpret existing findings.

Predictors and trajectories of risk are best examined in a prospective, longitudinal, population-based study of an inception cohort (first-time cases). Ideally, repeated suicide attempts and suicide would comprise distinct outcomes of a single study, although the latter requires a large sample to ensure sufficient power. The Danish nationwide registers offer a unique opportunity for such a large-scale investigation. Not only are demographic, clinical, and treatment data available for the entire population but Denmark also has a free public health care system, which means that all emergency department presentations for a suicide attempt can be captured. Accordingly, the present prospective cohort study utilized Danish registers with the following aims: (1) to identify predictors of repeated suicide attempts and suicide in individuals with a first presentation to emergency department after attempted suicide and (2) to investigate the timing of repeated attempts and suicide.

METHODS

Data Sources

Data were retrieved from several Danish longitudinal nationwide registers: the Civil Registration System,[14] which

contains demographic information on all people living in Denmark; the National Patient Register,[15] containing admission dates, discharge dates, and diagnoses for all inpatient, outpatient, and emergency department contacts at somatic hospitals; the Psychiatric Central Research Register[16] with corresponding information for all inpatient, outpatient, and emergency department contacts at psychiatric hospitals; and the Register of Causes of Death,[17] listing dates and causes of death. Individual data were linked through the unique personal identification number assigned to everyone at birth or upon first entry to Denmark as a migrant and used across all Danish registers.[18]

Clinical Points

- For patients with a first emergency department contact for attempted suicide, the highest risk for both repeating the attempt and suicide death occurs within a short period following discharge.
- After presenting to an emergency department with a first suicide attempt, most patients who later die by suicide (87%) do not return to emergency departments with another attempt, because their next attempt is fatal.
- Emergency department contact for attempted suicide and the time soon after discharge represent important opportunities for intervention and follow-up with patients to reduce the risk of repetition and, ultimately, save lives.

Sample

The sample comprised all individuals aged 10 years and older living in Denmark who, between January 1, 1996, and December 31, 2011, had been first recorded at psychiatric or somatic emergency departments with a suicide attempt (index attempt). Suicide attempts were incidents in the hospital registers with a suicide attempt listed as the cause of contact, the admission diagnosis of X60–X84 according to the *International Classification of Diseases, Tenth Revision* (*ICD-10*),[19] or both. Since information on emergency department visits became incorporated into the registers from January 1, 1995, we set the inception date 12 months later and used the entire year 1995 to ensure that the sample did not have previous emergency department contacts for suicide attempts.

Excluded were patients deceased on admission, those recorded with death from any cause within a day of discharge, and individuals transferred from emergency departments to somatic hospitals who died of any cause, either while in hospital or on the day of discharge. These conservative criteria aimed to distinguish emergency department contacts due to suicide attempts from suicides and probable suicides. The sample was followed from the index suicide attempt until repeated suicide attempt or suicide, death from other causes, migration, or end of the follow-up, whichever came first. The project was approved by the Danish Data Protection Agency.

Variables

The main outcomes in the study were repeated suicide attempts and death by suicide. The former was determined using the same criteria as for the index attempt, except that these were subsequent emergency department contacts; for the latter, the *ICD-10* codes of X60–X84 were used from the Register of Causes of Death.

Data comprised demographic, clinical, and treatment information. Demographic variables were gender and age group at the index attempt. Clinical data included the method of the index suicide attempt, subdivided into self-poisoning (X60–X69, T36–T50, T52–T60); hanging, strangling, or suffocation (X70); drowning (X71); firearms or explosives (X72–X75); burning (X76–X77, T20–T21, T27–T32); cutting or piercing (X78–X79, S51, S55, S59, S61, S65, S69); jumping from height (X80); jumping or lying under a moving vehicle (X81); and other (X82–X84, T33–T35). Following the descriptive analysis, categories with fewer than 100 observations were collapsed, leaving 4 types of methods: self-poisoning; hanging, strangling, or suffocation; cutting or piercing; and other. We also collected information on repetition of suicide attempt, total number of repeated attempts, number of days elapsed between the index and the repeated attempt, method of the repeated attempt, number of days elapsed between the index attempt and suicide death, and method of suicide.

Treatment variables comprised recent psychiatric treatment, operationalized as inpatient, outpatient, and/or emergency department contact with the admission diagnosis of a mental disorder during 12 months before the index suicide attempt. Thus, a single admission to the inpatient psychiatric unit or a single outpatient or emergency department visit accompanied by the principal diagnosis of a mental disorder was considered to constitute psychiatric treatment; recent psychiatric diagnoses were categorized into substance use (F10–F19), psychotic (F20–F25, F28–F29), affective (F30–F34, F38–F39), anxiety or adjustment (F40–F43), or personality (F60–F61) disorders or other disorders (remaining F codes). The presence or absence of each type of the disorders was based on admission and secondary diagnoses of the latest psychiatric contact, thus, the diagnoses were not mutually exclusive; type of emergency department attended for the index attempt; somatic hospitalization after the index attempt and its duration; and psychiatric hospitalization after the index suicide attempt and its duration.

Data Analysis

Data analysis involved 3 stages. First, following normality checks, between-group comparisons were carried out with χ^2 tests, independent sample *t* tests, and Kruskal-Wallis tests, as appropriate.[20] Second, univariable Cox proportional hazards regression models examined 7 variables as potential predictors of repeated suicide attempts and suicide death: gender, age group, method of the index attempt, recent psychiatric treatment, type of emergency department attended for the index attempt, somatic hospitalization after the index attempt, and psychiatric hospitalization after the index attempt. All statistically significant covariates ($P < .05$) were then entered into a multivariable Cox regression analysis. The stepwise backward selection method was used to minimize the risk of failing to detect a true effect (type II

Table 1. Demographic, Clinical, and Treatment Characteristics Associated With the Index Suicide Attempt

	Gender						
	Female		Male		Total Sample		
Variable	n	%	n	%	n	%	Significance Test[b]
Age group at index suicide attempt, y							$\chi^2_4 = 2{,}526.9$, $P < .001$
10–24	3,173	45.17	1,325	27.74	4,498	38.11	
25–34	1,054	15.00	974	20.39	2,028	17.18	
35–44	1,082	15.40	1,023	21.42	2,105	17.84	
45–54	935	13.31	747	15.64	1,682	14.25	
≥ 55	781	11.12	708	14.82	1,489	12.62	
Method of index suicide attempt[a]							$\chi^2_8 = 32{,}173.3$, $P < .0001$
Self-poisoning	3,762	71.36	2,141	62.26	5,903	67.76	
Hanging, strangling, suffocation	73	1.38	176	5.12	249	2.86	
Drowning	41	0.78	45	1.31	86	0.99	
Firearms or explosives	1	0.02	18	0.52	19	0.22	
Burning	12	0.23	20	0.58	32	0.37	
Cutting or piercing	1,232	23.37	914	26.58	2,146	24.64	
Jumping from height	17	0.32	20	0.58	37	0.42	
Jumping or lying under vehicle	10	0.19	10	0.29	20	0.23	
Other	124	2.35	95	2.76	219	2.51	
Recent psychiatric treatment							$\chi^2_1 = 368.0$, $P < .0001$
Yes	3,021	43.00	1,838	38.48	4,859	41.17	
No	4,004	57.00	2,939	61.52	6,943	58.83	
Recent psychiatric diagnoses							
Substance use disorder							$\chi^2_1 = 6{,}301.8$, $P < .0001$
Yes	737	10.49	852	17.84	1,589	13.46	
No	6,288	89.51	3,925	82.16	10,213	86.54	
Psychotic disorder							$\chi^2_1 = 8{,}612.7$, $P = .32$
Yes	498	7.09	362	7.58	860	7.29	
No	6,527	92.91	4,415	92.42	10,942	92.71	
Affective disorder							$\chi^2_1 = 6{,}738.7$, $P < .0001$
Yes	958	13.64	484	10.13	1,442	12.22	
No	6,067	86.36	4293	89.87	10,360	87.78	
Anxiety or adjustment disorder							$\chi^2_1 = 6{,}675.4$, $P < .0001$
Yes	949	13.51	514	10.76	1463	12.40	
No	6,076	86.49	4263	89.24	10,339	87.60	
Personality disorder							$\chi^2_1 = 7{,}946.1$, $P < .0001$
Yes	794	11.30	265	5.55	1,059	8.97	
No	6,231	88.70	4,512	94.45	10,743	91.03	
Other							$\chi^2_1 = 8{,}154.2$, $P < .0001$
Yes	655	9.32	341	7.14	996	8.44	
No	6,370	90.68	4,436	92.86	10,806	91.56	
Type of emergency department attended for index suicide attempt							$\chi^2_2 = 10{,}911.7$, $P < .0001$
Psychiatric	1,171	16.67	782	16.37	1,953	16.55	
Somatic	5,466	77.81	3,762	78.75	9,228	78.19	
Both	388	5.52	233	4.88	621	5.26	
Somatic hospitalization after index suicide attempt							$\chi^2_1 = 0.1$, $P = .797$
Yes	3,307	47.07	2,580	54.01	5,887	49.88	
No	3,718	52.93	2,197	45.99	5,915	50.12	
Psychiatric hospitalization after index suicide attempt							$\chi^2_1 = 5{,}401.1$, $P < .0001$
Yes	975	13.88	934	19.55	1,909	16.18	
No	6,050	86.12	3,843	80.45	9,893	83.82	

[a]Please note that information about the method of the index suicide attempt was not recorded for 1,753 women and 1,338 men.
[b]The reported values refer to significance testing within the categories of each variable, rather than gender differences.

error). Finally, for each significant multivariable covariate, time to repeated suicide attempt and time to suicide death was modeled using Kaplan-Meier survival analysis; Kaplan-Meier was also used for computing cumulative rates of repeated suicide attempts and suicide. For individuals with multiple suicide attempts, only the first of the repeated attempts was analyzed. Statistical analyses were performed using the SAS software, version 9.3 (SAS Institute, Inc; Cary, North Carolina), and the STATA/MP software, version 13.1 (StataCorp, LP).

RESULTS

Index Suicide Attempt

During the follow-up, 11,802 individuals presented to emergency departments after attempted suicide: 59.5% (n = 7,025) women and 40.5% (n = 4,777) men. The mean age at the index attempt was 34.5 years (SD = 16.7). Table 1 shows that two-thirds of the index attempts were self-poisonings, and cutting or piercing was the second most common method. Over a third of the sample had recent psychiatric

Table 2. Univariable and Multivariable Hazard Ratios (HRs) for Repeated Suicide Attempt After the Index Suicide Attempt

Variable	Repeat Suicide Attempt, n (%)	Univariable HR (95% CI)	*P*	Multivariable HR (95% CI)[a]	*P*
Gender					
Female	1,297 (67.59)	1		1	
Male	622 (32.41)	0.70 (0.63–0.77)	<.001	0.70 (0.63–0.79)	<.001
Age group at index suicide attempt, y					
10–24	772 (40.23)	1			
25–34	346 (18.03)	0.95 (0.84–1.08)	.468		
35–44	376 (19.59)	0.99 (0.88–1.12)	.914		
45–54	256 (13.34)	0.88 (0.76–1.01)	.075		
≥55	169 (8.81)	0.68 (0.58–0.8)	<.001		
Method of index suicide attempt					
Self-poisoning	951 (63.91)	1		1	
Hanging, strangling, suffocation	36 (2.42)	0.77 (0.55–1.07)	.116	0.94 (0.67–1.32)	.731
Cutting or piercing	446 (29.97)	1.26 (1.12–1.41)	<.001	1.22 (1.08–1.36)	<.001
Other	55 (3.70)	0.69 (0.53–0.91)	.01	0.70 (0.53–0.92)	.011
Recent psychiatric treatment					
No	767 (39.97)	1		1	
Yes	1,152 (60.03)	2.24 (2.04–2.45)	<.001	2.19 (1.97–2.43)	<.001
Type of emergency department attended for index suicide attempt					
Psychiatric	298 (15.53)	1		1	
Somatic	1,483 (77.28)	1.32 (1.16–1.5)	<.001	1.31 (1.14–1.51)	<.001
Both	138 (7.19)	1.54 (1.26–1.89)	<.001	1.45 (1.17–1.79)	<.001
Somatic hospitalization after index suicide attempt					
No	993 (51.75)	1			
Yes	926 (48.25)	1.04 (0.95–1.14)	.346		
Psychiatric hospitalization after index suicide attempt					
No	1,629 (84.89)	1		1	
Yes	290 (15.11)	0.83 (0.73–0.94)	.001	0.81 (0.7–0.94)	.004

[a]The multivariable model was adjusted for gender, recent psychiatric treatment, method of the index suicide attempt, type of emergency department attended for the index suicide attempt, and psychiatric hospitalization after the index attempt. During data exploration, we performed the univariable Cox proportional hazards regression analyses for each type of the diagnostic categories. All 6 covariates significantly predicted repetition of suicide attempt. However, of concern was a limited practical utility of a model comprising 11 predictors had we included those 6 variables in the multivariable analysis. Therefore, we chose instead to incorporate a related covariate: recent psychiatric treatment. We believed the latter was more clinically useful since it referred to *any* type of psychiatric treatment within 12 months prior to the index suicide attempt, that is, inpatient hospitalization, outpatient treatment, and/or emergency department contact due to a mental health issue.

treatment, most often for substance use, affective disorders, and anxiety or adjustment disorders. Most individuals sought care for the index attempt from somatic emergency departments. Among those who received further treatment at somatic and/or psychiatric hospitals, the median somatic admission lasted 1 day (mean = 3.1, SD = 11.2; range, 1–250), and the median psychiatric admission lasted 4 days (mean = 18.9, SD = 70.5; range, 1–2,217).

Repeated Suicide Attempts

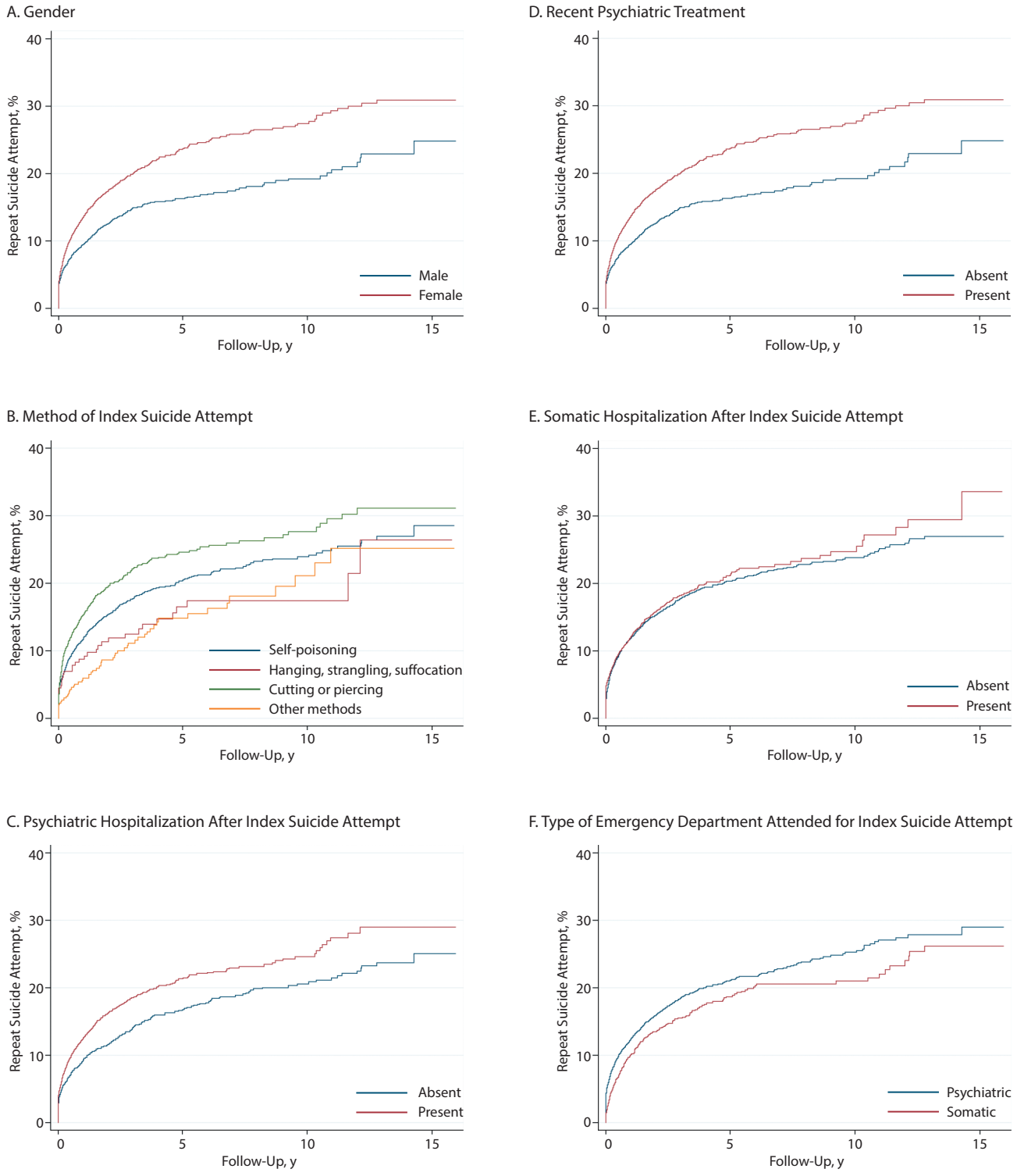
In all, 16.3% (n = 1,919) of the patients made further attempts at suicide; of those, 67.6% (n = 1,297) were women and 32.4% (n = 622) were men. Two-thirds repeated suicide attempt once (66.2%, n = 1,271), whereas others had multiple attempts (median = 1, mean = 2.3, SD = 4.1; range, 1–65). Self-poisoning (49.6%, n = 951) and cutting or piercing (23.2%, n = 446) continued to be used most frequently.

Predictors of repeated suicide attempts. Table 2 presents univariable and multivariable hazard ratios for the potential predictors of repeated suicide attempts. All covariates significantly increased the risk of repeated attempts in the multivariate model, except age, somatic hospitalization after the index attempt, and hanging, strangling, or suffocation. Recent psychiatric treatment was the strongest predictor, with a 2-fold increase in the likelihood of repetition. According to Somers *D* concordance statistic, the final model improved prediction by 28% compared to a baseline model.

Additional analyses of 1,919 individuals who repeated attempts at suicide indicated that patients with psychiatric hospitalization for the index suicide attempt had significantly longer intervals until the second attempt (median = 240 days, mean = 527.4, SD = 813.1), compared to their counterparts without psychiatric hospital treatment (median = 124 days, mean = 334.5, SD = 554.3, $\chi^2_1 = 934.3$, $P < .001$). Conversely, individuals whose index suicide attempt led to somatic hospitalization did not differ in the length of time until the second suicide attempt from those without somatic hospitalization (median = 121 days, mean = 308.2, SD = 519.1 vs median = 159 days, mean = 415.4, SD = 670.2, $\chi^2_1 = 2.3$, $P < .126$).

Time between the index and the repeated attempts. The cumulative rate for the repeated suicide attempts was 3.6% within 1 week of discharge after the index attempt, 4.2% within 2 weeks, 4.9% by the end of first month, 7.1% within

Figure 1. Percentages of Repeated Suicide Attempts During 16 Years of Follow-Up After the Index Suicide Attempt According to Each Significant Multivariable Predictor



3 months, 9.2% within 6 months, 11.8% within 1 year, 15.5% within 2 years, 17.9% within 3 years, 20.7% within 5 years, and 24.2% within 10 years. The increment of the cumulative rate of repeated attempts was particularly steep within a week of the index attempt. Figure 1 displays the proportion of repeated suicide attempts since the index attempt as a function of each significant multivariable predictor of repetition.

Suicide Deaths

One hundred sixty patients (1.4%) died as a result of suicide; of those, 43.8% (n = 70) were women and 56.3%

Table 3. Univariable and Multivariable Hazard Ratios (HRs) for Suicide After the Index Suicide Attempt

Variable	Repeat Suicide Attempt, n (%)	Univariable HR (95% CI)	*P*	Multivariable HR (95% CI)[a]	*P*
Gender					
Female	70 (43.75)	1			
Male	90 (56.25)	1.92 (1.41–2.63)	<.001		
Age group at index suicide attempt, y					
10–24	13 (8.13)	1		1	
25–34	21 (13.13)	3.3 (1.65–6.59)	<.001	2.68 (1.29–5.58)	.0084
35–44	47 (29.38)	7.08 (3.83–13.1)	<.001	5.56 (2.89–10.69)	<.001
45–54	36 (22.50)	7.24 (3.84–13.65)	<.001	5.87 (3.00–11.46)	<.001
≥55	43 (26.88)	10.62 (5.71–19.75)	<.001	7.85 (4.04–15.27)	<.001
Method of index suicide attempt					
Self-poisoning	61 (46.21)	1		1	
Hanging, strangling, suffocation	10 (7.58)	2.97 (1.52–5.82)	.002	2.55 (1.29–5.01)	.007
Cutting or piercing	44 (33.33)	1.84 (1.25–2.71)	.002	1.81 (1.22–2.67)	.003
Other	17 (12.88)	3.17 (1.84–5.43)	<.001	2.61 (1.52–4.48)	<.001
Recent psychiatric treatment					
No	80 (50)	1			
Yes	80 (50)	1.37 (1.00–1.87)	.05		
Type of emergency department attended for index suicide attempt					
Psychiatric	42 (26.25)	1			
Somatic	104 (65.00)	0.77 (0.53–1.12)	.16		
Both	14 (8.75)	1.2 (0.65–2.23)	.561		
Somatic hospitalization after index suicide attempt					
No	96 (60)	1			
Yes	64 (40)	0.82 (0.59–1.12)	.211		
Psychiatric hospitalization after index suicide attempt					
No	105 (65.63)	1		1	
Yes	55 (34.38)	2.3 (1.65–3.2)	.001	1.74 (1.22–2.49)	.002

[a]The multivariable model was adjusted for age group, method of the index suicide attempt, and psychiatric hospitalization after the index suicide attempt.

(n = 90) were men. Individuals aged 35–44 years accounted for nearly a third of all suicides. Self-poisoning was the most common method of suicide (33.8%, n = 54), followed by hanging, strangling, or suffocation (31.3%, n = 50). For most individuals who died by suicide (86.9%, n = 139), the emergency department contact associated with the index attempt was their first and last presentation for a suicide attempt (no repeat attempts), whereas 8.1% (n = 13) repeated suicide attempt once before death and 5.0% (n = 8) had between 2 and 5 repeat attempts. Men were less likely than women to repeat suicide attempts before dying by suicide albeit this trend did not reach statistical significance.

Predictors of suicide. Table 3 presents the results from the regression analysis regarding the risk of death by suicide. Male gender; older age; index suicide attempt by hanging, strangling, or suffocation; recent psychiatric treatment; and psychiatric hospitalization after the index attempt significantly increased the risk of suicide. However, significant covariates in the multivariable model included age, method of the index suicide attempt, and psychiatric hospitalization after the index attempt. Age was the strongest predictor of suicide, raising the odds 5 times among those 35 years or older at the index attempt and 7 times among individuals over 55 years. The final model improved prediction by 49% compared to the baseline model.

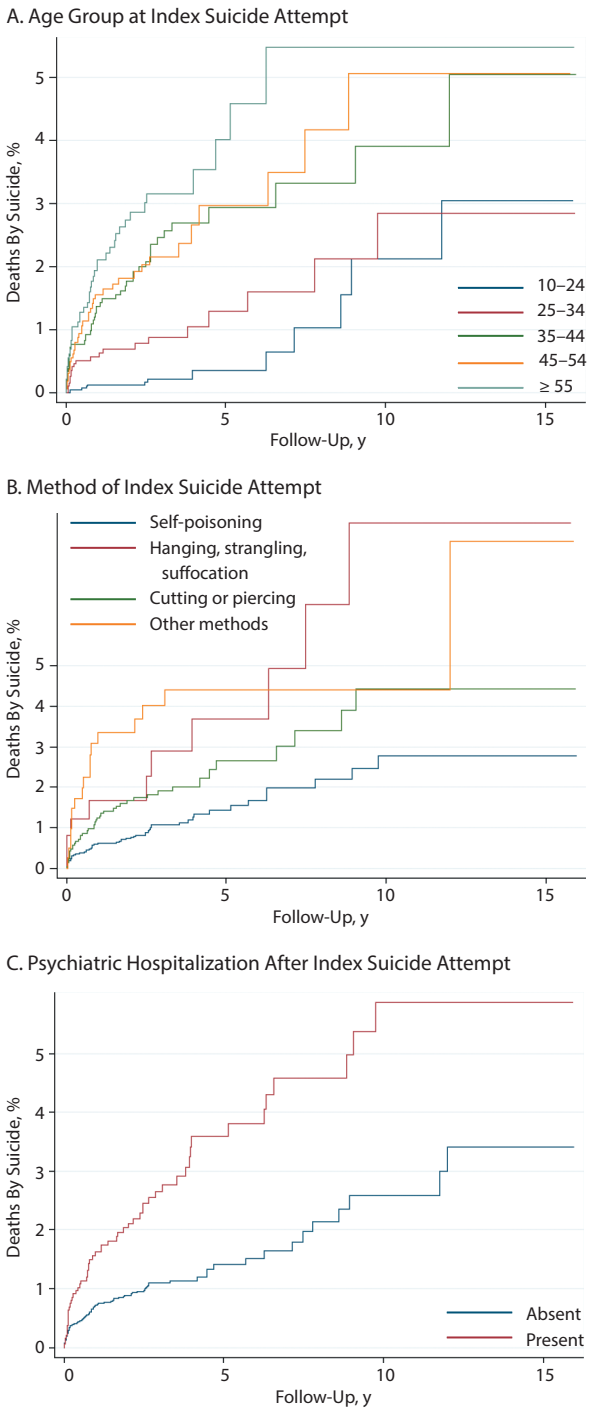
Further analyses comparing individuals with psychiatric hospitalization for the index attempt who later died by suicide, and those who did not, revealed that the risk was highest among people over 35 years at the index attempt ($\chi^2_1 = 52.9$, $P < .0001$) and those who presented to a psychiatric emergency department for the index attempt ($\chi^2_1 = 15.6$, $P < .0001$).

Time between the index suicide attempt and suicide. The cumulative rates for all 160 suicides in the total sample were 0.1% within 1 week of discharge after the index suicide attempt, 0.1% within 2 weeks, 0.2% by the end of first month, 0.5% within 3 months, 0.6% within 6 months, 0.9% within 1 year, 1.1% within 2 years, 1.4% within 3 years, 1.8% within 5 years, and 3.4% within 10 years. The increment of the cumulative rate of suicides was particularly steep in the first week of the index attempt. Figure 2 depicts the proportion of suicides during up to 16 years of follow-up for the significant multivariable predictors of suicide.

DISCUSSION

To our knowledge, this is the first prospective, longitudinal, population-based study simultaneously examining predictors of repeated suicide attempts and predictors of suicide in an inception cohort of emergency department patients who attempted suicide. There was no major overlap between the multivariate predictors of repeated suicide attempts and suicide deaths. Specifically, female gender, cutting or piercing at the index attempt, and

Figure 2. Percentages of Suicides During 16 Years of Follow-Up After the Index Suicide Attempt According to Each Significant Multivariable Predictor



psychiatric treatment within 12 months prior to the index suicide attempt predicted repetition. Conversely, at the highest risk of death by suicide were individuals aged 35 years and older; those who attended an emergency department after attempted hanging, strangling, or suffocation; and persons who received inpatient psychiatric treatment immediately after the index suicide attempt.

Consistent with past research on individuals seeking emergency care for attempted suicide, approximately two-thirds of the present sample were women[6–9,12,21] and patients' mean age was 34 years.[7–9,12,21] We also found that self-poisoning was the most common method of the index attempt, and repeated attempts,[5,6,8,9,13,21–23] whereas hanging, strangling, or suffocation was the most frequently used method of suicide.[13] During up to 16 years follow-up, 16% of the present sample repeated suicide attempts and 1.4% died by suicide. Earlier studies reported higher repetition rates of attempted suicide and death by suicide over shorter follow-ups, 23%–37%[11,13,21] and 1.9%–6.7%,[13,21,22] respectively. The discrepancies are most likely due to the conservative criteria for inclusion as a suicide attempt and suicide in this study given that the estimates of suicide risk in our cohort at 6 months (0.6%) and at 1 year (0.9%) of follow-up were in line with past research.[13,21]

Our study has 3 key findings with implications for clinical practice. First, the highest rates of both repeated attempts and suicides occurred within a week of discharge from an emergency department following the index attempt. This result concurs with an increased risk of intentional self-harm and suicide among patients recently discharged from psychiatric inpatient care.[24–26] Thus, provision of adequate support immediately after discharge from an emergency department to patients who survived suicide attempts may be crucial in preventing further attempts, including those that result in death. A new large, multicenter study[27] has demonstrated a protective effect of psychosocial therapy on both outcomes over the short- and long-term follow-up periods. There is also emerging evidence that friendly letters or postcards sent after patients' presentation to an emergency department for attempted suicide can help to reduce the frequency of subsequent attempts.[28]

The second and related finding is that most individuals who died by suicide (87%) did not return to emergency departments with another suicide attempt; that is, their next attempt was fatal. Although our data did not include outpatient psychiatric treatment or nonsuicide-related emergency department visits after the index attempt, it is common for this patient group to not attend the recommended follow-up outpatient treatment.[29] Therefore, for some individuals, brief psychosocial interventions delivered at emergency departments, such as the Safety Planning Intervention[30] or the teachable moment brief intervention,[31] may represent the *only* opportunity to intervene and, ultimately, save lives.

Third, almost 80% of all patients who presented to emergency departments following a suicide attempt contacted emergency departments of somatic hospitals. However, clinicians at somatic emergency departments often lack relevant psychiatric knowledge to provide optimal care for suicidal individuals.[32,33] Educating clinicians at somatic emergency departments about the factors that increase the risk of repeated attempts as well as suicide could assist in identifying patients who may be in the greatest need of psychiatric follow-up prior to discharge. Information about the demographic and clinical characteristics that constitute

the major predictors is already routinely collected as part of the intake process at emergency departments.

In this study, psychiatric hospitalization appeared to have a protective effect by lowering the overall risk of repetition of suicide attempts. Moreover, among patients who engaged in further attempts, those who received psychiatric hospital treatment after the index attempt had almost twice as long an interval until the second attempt compared to their counterparts without psychiatric hospital treatment. Nevertheless, psychiatric hospitalization for the index suicide attempt was also one of the predictors of suicide. These conflicting results can be interpreted in two ways. On one hand, the findings could indicate that psychiatric hospitalization had targeted most high-risk individuals. Consequently, it could be concluded that it successfully prevented further suicide attempts in some patients and extended the time between the attempts in others. Consistent with this view, the elevated hazard ratios associated with psychiatric hospitalization for individuals who died by suicide could be seen as a proxy for the severity of suicide risk. However, the alternative explanation of the findings is that psychiatric hospitalization may be iatrogenic. According to this view, the reduced risk of repetition may not be a true effect but a result of excluding from the analysis most individuals (139/160) who died by suicide because they had no repeated attempts. In addition, the extended interval between attempts could be simply due to the length of time spent in hospital—a place where supervision and the features of the physical environment make further attempts more difficult.

Further research is needed to clarify how and when psychiatric hospitalization may best function as an intervention for the index suicide attempt. In our study, the only characteristics distinguishing individuals with a psychiatric hospitalization for the index attempt who died by suicide from those who did not was age of 35 years or above and seeking help from a psychiatric emergency department for the index suicide attempt. However, it is possible that psychiatric hospitalization might have a differential effect on the risk of repetition and suicide based on the co-occurrence of psychiatric and/or physical disorders, which represent an increased overall burden of disease. Future investigation could address this question. It might also be useful to explore the impact of the different types of treatment provided in the psychiatric inpatient unit (eg, cognitive-behavioral therapy or dialectical behavior therapy) on the subsequent rates of repeated suicide attempts and deaths by suicide. Unfortunately, register data alone are not sensitive enough to address such questions and would need to be combined with information from hospital databases, patient medical records, and qualitative sources.

A major strength of the present study was the use of Danish nationwide registers as a data source, as these allowed capture of all first-time emergency department presentations for a suicide attempt in the whole country. Consequently, the study avoided the risk of sampling bias due to nonconsenting individuals. Furthermore, availability of complete information about emigration and death meant there was no loss of patients over the follow-up. Notwithstanding the strengths, the study had limitations. It is possible that some patients had received emergency care for attempted suicide before the information on emergency department contacts became incorporated into the hospital registers. Moreover, the index suicide attempts and the repeated attempts are likely to be underestimated because not all suicide attempts come to medical attention and hence are not recorded in the hospital registers. It has also been noted that suicide attempts are underreported in the Danish registers, even among the patients who present to emergency departments.[34,35] Finally, some suicide attempts were listed as such by clinicians in the cause of contact section of the hospital registers, whereas others were based on the *ICD-10* admission diagnosis X60–X84. The *ICD-10* does not have a specific code for attempted suicide and uses a more generic term of intentional self-harm. We did not have additional information that could help to confirm suicidal intent for all incidents; thus, some suicide attempts included in the study might represent medically serious episodes of self-harm with no intent to die, rather than a "true" suicide attempt.

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Author contributions: All authors participated in the conception and design of the study, and had full access to all the data. Drs Fedyszyn, Hjorthøj, and Erlangsen take responsibility for the integrity of the data and the accuracy of the data analysis. Dr Fedyszyn wrote the manuscript, and Drs Erlangsen, Hjorthøj, Madsen, and Professor Nordentoft critically revised the drafts for important intellectual content. All authors approved the final draft of the manuscript and agree to be accountable for all aspects of the work.

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Additional information: All registers from which the authors retrieved the data for the current study belong to the Danish government and were accessed through Statistics Denmark (http://www.dst.dk/en) with permission from the Danish Data Protection Agency. Under the current legislation, individual level data can be accessed only by researchers who live in Denmark and are associated with Danish academic or research institutions.

REFERENCES

1. Suicide data. World Health Organization website. http:www.who.int/mental_health/prevention/suicide/suicideprevent/en/. Accessed December 1, 2014.
2. Larkin GL, Beautrais AL. Emergency departments are underutilized sites for suicide prevention. *Crisis*. 2010;31(1):1–6.
3. O'Connell ME, Boat T, Warner KE. *Preventing Mental, Emotional and Behavioural Disorders Among Young People*. Washington, DC: The National Academic Press; 2009.
4. Dhossche DM. Suicidal behavior in psychiatric emergency room patients. *South Med J*. 2000;93(3):310–314.
5. Joubert L, Petrakis M, Cementon E. Suicide attempt presentations at the emergency department: outcomes from a pilot study examining precipitating factors in deliberate self-harm and issues in primary care physician management. *Soc Work Health Care*. 2012;51(1):66–76.
6. Lee CA, Choi SC, Jung KY, et al. Characteristics of patients who visit the emergency department with self-inflicted injury. *J Korean Med Sci*. 2012;27(3):307–312.
7. Nojomi M, Malakouti SK, Bolhari J, et al. Epidemiology of suicide attempters resorting to emergency departments in Karaj, Iran, 2003.

Eur J Emerg Med. 2008;15(4):221–223.
8. Schnyder U, Valach L. Suicide attempters in a psychiatric emergency room population. *Gen Hosp Psychiatry*. 1997;19(2):119–129.
9. Zhang J, Jia S, Jiang C, et al. Characteristics of Chinese suicide attempters: an emergency room study. *Death Stud*. 2006;30(3):259–268.
10. Beautrais AL. Further suicidal behavior among medically serious suicide attempters. *Suicide Life Threat Behav*. 2004;34(1):1–11.
11. Bilén K, Ottosson C, Castrén M, et al. Deliberate self-harm patients in the emergency department: factors associated with repeated self-harm among 1524 patients. *Emerg Med J*. 2011;28(12):1019–1025.
12. Cooper J, Kapur N, Webb R, et al. Suicide after deliberate self-harm: a 4-year cohort study. *Am J Psychiatry*. 2005;162(2):297–303.
13. Hawton K, Zahl D, Weatherall R. Suicide following deliberate self-harm: long-term follow-up of patients who presented to a general hospital. *Br J Psychiatry*. 2003;182(6):537–542.
14. Pedersen CB, Gøtzsche H, Møller JØ, et al. The Danish Civil Registration System: a cohort of eight million persons. *Dan Med Bull*. 2006;53(4):441–449.
15. Lynge E, Sandegaard JL, Rebolj M. The Danish National Patient Register. *Scand J Public Health*. 2011;39(7 suppl):30–33.
16. Mors O, Perto GP, Mortensen PB. The Danish Psychiatric Central Research Register. *Scand J Public Health*. 2011;39(7 suppl):54–57.
17. Helweg-Larsen K. The Danish Register of Causes of Death. *Scand J Public Health*. 2011;39(7 suppl):26–29.
18. Erlangsen A, Fedyszyn I. Danish nationwide registers for public health and health-related research. *Scand J Public Health*. 2015;43(4):333–339.
19. *International Statistical Classification of Diseases and Related Health Problems, 10th Revision* (*ICD-10*). World Health Organization website. http://apps.who.int/classifications/icd10/browse/2010/en. Accessed October 24, 2014.
20. Field A. *Discovering Statistics Using SPSS*. London, England: Sage; 2005.
21. Beautrais AL. Subsequent mortality in medically serious suicide attempts: a 5 year follow-up. *Aust N Z J Psychiatry*. 2003;37(5):595–599.
22. Choi JW, Park S, Yi KK, et al. Suicide mortality of suicide attempt patients discharged from emergency room, nonsuicidal psychiatric patients discharged from emergency room, admitted suicide attempt patients, and admitted nonsuicidal psychiatric patients. *Suicide Life Threat Behav*. 2012;42(3):235–243.
23. Hawton K, Bergen H, Cooper J, et al. Suicide following self-harm: findings from the Multicentre Study of self-harm in England, 2000–2012. *J Affect Disord*. 2015;175:147–151.
24. Gunnell D, Hawton K, Ho D, et al. Hospital admissions for self harm after discharge from psychiatric inpatient care: cohort study. *BMJ*. 2008;337:a2278.
25. Qin P, Agerbo E, Westergård-Nielsen N, et al. Gender differences in risk factors for suicide in Denmark. *Br J Psychiatry*. 2000;177(6):546–550.
26. Qin P, Nordentoft M. Suicide risk in relation to psychiatric hospitalization: evidence based on longitudinal registers. *Arch Gen Psychiatry*. 2005;62(4):427–432.
27. Erlangsen A, Lind BD, Stuart EA, et al. Short-term and long-term effects of psychosocial therapy for people after deliberate self-harm: a register-based, nationwide multicentre study using propensity score matching. *Lancet Psychiatry*. 2015;2(1):49–58.
28. Milner AJ, Carter G, Pirkis J, et al. Letters, green cards, telephone calls and postcards: systematic and meta-analytic review of brief contact interventions for reducing self-harm, suicide attempts and suicide. *Br J Psychiatry*. 2015;206(3):184–190.
29. Jauregui J, Martínez ML, Rubio G, et al. Patients who attempted suicide and failed to attend mental health centres. *Eur Psychiatry*. 1999;14(4):205–209.
30. Stanley B, Brown GK. Safety Planning Intervention: a brief intervention to mitigate suicide risk. *Cognit Behav Pract*. 2012;19(2):256–264.
31. O'Connor SS, Comtois KA, Wang J, et al. The development and implementation of a brief intervention for medically admitted suicide attempt survivors. *Gen Hosp Psychiatry*. 2015;37(5):427–433.
32. Benford DM. Caring for Suicidal Patients in the Emergency Department: Where Nursing Knowledge Falls Short [dissertation]. Tucson, AZ: University of Arizona College of Nursing; 2009. https://w3.nursing.arizona.edu/Library/Benford_Dawn_MS_Report.pdf. Published 2009. Accessed November 19, 2014.
33. Kerrison SA, Chapman R. What general emergency nurses want to know about mental health patients presenting to their emergency department. *Accid Emerg Nurs*. 2007;15(1):48–55.
34. Nordentoft M, Søgaard M. Registration, psychiatric evaluation and adherence to psychiatric treatment after suicide attempt. *Nord J Psychiatry*. 2005;59(3):213–216.
35. Helweg-Larsen K. *Suicide in Denmark: A Significant Drop in Suicide, But an Increasing Number of Suicide Attempts. Why?* [in Danish] Copenhagen, Denmark: National Institute of Public Health; 2006.

Editor's Note: We encourage authors to submit papers for consideration as a part of our Focus on Suicide section. Please contact Maria A. Oquendo, MD, at moquendo@psychiatrist.com.