Predictors of Psychiatric Inpatient Suicide: A National Prospective Register-Based Study

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ABSTRACT

Objective: To study the incidence and risk factors of psychiatric inpatient suicide within a national cohort representing all psychiatric hospital admissions.

Method: This national prospective register-based study followed all psychiatric hospital admissions in Denmark from the date of patient admission until patient discharge *or* inpatient suicide over a 10-year study period from 1997 through 2006. By using survival analysis techniques, this study was the first to take the inpatient *time at risk* into account in the estimation of the suicide rate and the predictors of suicide among hospital-admitted psychiatric patients.

Results: Among 126,382 psychiatric inpatients aged 14 years or older, 279 suicides occurred. The risk of inpatient suicide was high: 860 suicides per 100,000 inpatient years. Of those individuals who completed suicide, 50% died within 18 days of admission. The inpatient suicide rate significantly decreased, about 6% each year (HR = 0.94; 95% CI, 0.90–0.99), over this 10-year period. Several significant predictors of suicide were found, including the following: Patients with a bachelor's degree had a significantly higher hazard ratio (HR) of suicide compared with those with a primary school education (HR = 0.41; 95% CI, 0.29–0.60) or those with vocational training (HR = 0.54; 95% CI, 0.39–0.77). Having a personality disorder as a secondary diagnosis (all psychiatric diagnoses were made according to *ICD-10*) raised the risk of suicide (HR = 1.60; 95% CI, 1.01–2.53), as did having recent contact (within the last year) with a private psychologist (HR = 1.85; 95% CI, 1.05–3.28). Recent suicide attempt before admission to the hospital was associated with the highest risk of inpatient suicide (HR = 4.99; 95% CI, 3.57–6.96).

Conclusions: This study demonstrated a high risk of psychiatric inpatient suicide in Denmark of 860 per 100,000 inpatient years and also revealed several significant predictors of psychiatric inpatient suicide. Furthermore, the inpatient suicide rate decreased from 1997 through 2006 in Denmark.

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Psychiatric patients have a higher risk of suicide compared to the general population.[1–6] Two especially high-risk periods for suicide have been emphasized—during hospitalization and during the period immediately after discharge from the hospital.[7–10] Suicide among psychiatric inpatients has been estimated to account for about 9% and 5% of all suicides among Danish women and men, respectively.[5] Toward the end of the last century, the suicide rate among psychiatric inpatients decreased but at a slower pace compared to the general population.[2] Since psychiatric inpatients are regarded as a suicidal high-risk group, it is common practice to evaluate patients' suicidal predispositions; thus, an inpatient stay is expected to be protective against suicide. Although some inpatient suicides *may* be inevitable, inpatient suicide is regarded as unacceptable by health authorities and relatives.

Previous studies focusing on risk factors for psychiatric inpatient suicide have been descriptive[11–14] or case-control[15–24] studies, but no national prospective follow-up studies have been carried out.[25] By using the unique Danish registers, we had the opportunity to carry out a national prospective cohort study, following each psychiatric admission until patient discharge *or* inpatient suicide. This study design provides the opportunity to take the *time at risk* into account in the estimation of predictors.

Patient sociodemographic characteristics, use of clinical outpatient care, and information on each psychiatric admission are also recorded in the registers, which provides the additional possibility to examine these important data as predictors of psychiatric inpatient suicide.

Hence, our objective was to use register data to examine (1) the frequency of inpatient suicide in a national psychiatric inpatient population; (2) sociodemographic characteristics, past suicide attempt, and clinical care as predictors of psychiatric inpatient suicide; and (3) change in the inpatient suicide rate through time, from 1997 through 2006.

METHOD

Individual data from 5 Danish longitudinal register databases were merged by means of the unique 10-digit identifier number[26] assigned to all persons living in Denmark and used across all registration systems. The Danish Psychiatric Central Register[27] covers all psychiatric inpatient facilities in Denmark and contains longitudinal information on all admissions and discharges since 1969. Since 1995, data on psychiatric outpatient treatment have also been recorded in this register. There are no private psychiatric hospitals in Denmark, and all inpatient and outpatient treatment is free of charge for all Danish citizens and persons with residence permits. The Danish Cause of Death Register[28] is based on all death certificates issued in Denmark and contains data on the date and cause of death. Death by suicide has been recorded since 1970 and is defined according to *International*

Classification of Diseases, Tenth Revision (ICD-10)[29] codes X60–X84. Information on treated suicide attempts under somatic hospital care was retrieved from The Danish Patient Registry.[30] The Health Insurance Register[31] contains information on all outpatient private psychiatric and private psychologist appointments subsidized or partly subsidized by the authorities. Finally, the Integrated Database for Longitudinal Labor Market Research[32] has gathered annually, from 1980 onward, information from several administrative registers on the entire population living in Denmark as of December 31st. Inpatient suicide cases were determined by identifying those patients registered in The Danish Psychiatric Central Register as dead at discharge and classified as a suicide in The Danish Cause of Death Register.

In the Danish Cause of Death Register, the geographic location of a person at death is registered, and this information illuminated how many of the admitted patients actually died at the hospital compared with outside of the hospital.

The study population consisted of the individuals from 356,712 psychiatric inpatient admissions from 1997 through 2006. These admissions were distributed among 126,382 individuals aged 14 years or older. Patients were included if they had an admission during this period, regardless of whether or not they had any previous admissions before 1997. Consequently, patients who had admissions dating back to 1969, when this data originally began to be recorded, were included in this cohort study if they were admitted during the time span of 1997–2006.

Among these admissions, 279 inpatient suicides and 863 inpatient deaths occurred. The youngest patient to die by suicide was 14 years old and the oldest was 89. In the analyses, patients were divided into 5 age groups: 14–30, 31–40, 41–50, 51–60, and over 60 years.

This study was approved by The Danish Data Protection Agency.

Information on Clinical Care and Suicide Attempt

In the *ICD-10*, all mental illnesses are coded in the *F* chapter. We used the primary *ICD-10* diagnosis given at each admission. Diagnoses were categorized into substance abuse (*ICD-10* codes F10–F19), schizophrenia (*ICD-10* codes F20–F29), affective disorders (*ICD-10* codes F30–F39), stress-related disorders or personality disorders (*ICD-10* codes F40–F49 and F60–F69), and all others. Secondary diagnoses also recorded were substance abuse (*ICD-10* codes F10–F19), affective disorders (*ICD-10* codes F30–F39), and personality disorders (*ICD-10* code F60).

Information about the type of admission was also included; thus, for each psychiatric admission, it was registered whether it was a planned admission or an acute admission and whether it was a voluntary or compulsory hospitalization. Last, for patients with several admissions, time between admissions was recorded, and re-admission within 30 days was examined as a risk factor for inpatient suicide.

Clinical outpatient care was defined in this study according to whether a patient had had contact with (1) psychiatric outpatient treatment, (2) a private psychiatrist, or (3) a private psychologist during the last year before the present psychiatric admission. We had information only on outpatient contacts that were referred via the public health insurance system. A 1-year range was chosen in order to reduce the number of contacts that were not relevant or important in relation to the present hospital admission.

Hospital admissions connected to earlier suicide attempts were traced in The Danish Patient Registry. We traced records only for the date of the last hospital admission with a suicide attempt before each admission. In the analyses, we split suicide attempts into either (1) a recent suicide attempt during the last 7 days before the admission or (2) an earlier suicide attempt.

Sociodemographic Variables

Sociodemographic factors were assessed for December of the year before the psychiatric hospital admission. Gross annual income (wages, pensions, unemployment and social security benefits, and interest rates) was grouped into age-sex-year population-based quartiles (ie, also based on those who had never been hospitalized). Labor market affiliation was categorized as (1) employed (including adolescents, students, housewives without labor market attachment, and patients with sick benefits), (2) unemployed, (3) in early retirement, and (4) retired. Level of education was grouped into primary school, high school, vocational training, and a bachelor's degree or higher. Cohabitation status was divided into 4 categories: (1) cohabiting/married (cohabiting is defined as couples of the opposite sex who live together with shared address and an age difference of less than 15 years and who are not first-degree relatives), (2) unmarried and living alone, (3) widowed/divorced, and (4) other.

Statistical Analysis

Simple statistical procedures were carried out to show the distribution of the inpatient suicides over the sociodemographic and clinical variables. Kaplan-Meier curves were performed to illustrate the proportion of inpatient suicides

Clinical Points

- Patients who attempted suicide in the week before psychiatric admission had a 5-fold higher risk of inpatient suicide compared with patients who did not have a recent suicide attempt.
- Patients with the highest level of education had an increased risk of inpatient suicide compared with patients with a lower level of education.
- Fifty-eight percent of the completed inpatient suicides occurred outside the hospital among patients who either were taking an agreed-upon leave or had absconded from the hospital.

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by admission number, sex, and diagnosis during the first 30 days of admission, when the risk of suicide is especially high. Cox proportional hazards models[33–36] were used to analyze the univariate and multivariable associations between covariates and inpatient suicides. For the Cox analyses, patients were followed from each admission until death or discharge, thereby allowing for inclusion of the *time at risk* during each admission in the analyses. In addition, another measure of *time at risk* was made by stratifying all survival analyses by admission number.

The analyses were categorized into 2 domains: social variables and clinical variables. First, multivariable analyses were carried out in each domain, including adjustment for 3 variables: sex, age group, and calendar year. Second, those variables that were significant ($P < .05$) in each domain were carried forward to joint multivariable regression analyses. The joint analyses also present the test estimates of the sex, age group, and calendar year variables. We used robust standard error estimates to account for the fact that many individuals were admitted several times.[37]

RESULTS

The study included 279 inpatient suicides among 126,382 admitted patients, who had a total of 356,712 psychiatric hospital admissions. In total risk time, these admissions accounted for 11,837,916 days of admission, corresponding to 78 suicides per 100,000 admissions, 221 suicides per 100,000 patients, and 860 suicides per 100,000 inpatient years. An inpatient suicide occurred in 0.08% of the admissions. Twenty-four percent (67 of 279) of the suicides happened during the patient's first-ever admission, and 62% of the suicides were completed before the patient's fifth admission, while up to 38% of the suicides were completed by patients who had had several admissions. During an admission, the median time before suicide was 18 days, whereas 25% and 75% of the suicides happened within 6 days and within 57 days of admission, respectively. The most common method of suicide was hanging, strangulation, or suffocation (48%), followed by poisoning (14%). Jumping from a height (11%), drowning (9%), or jumping in front of a moving vehicle (7%) were less frequent methods. Geographically, of the 279 inpatients who completed suicide, 117 died in the hospital, 36 died at home, and 126 died in another place. (The patients who died outside the hospital [58%] could have been on agreed-upon leave or could have absconded from the hospital ward.) Among those who died in the hospital, the most frequent method used was hanging, strangulation, or suffocation (66%), and the second most frequent was poisoning (6%).

Table 1 shows the characteristics of the study population. Of the 279 inpatients who died by suicide, 37% were female and 63% were male, 42% had attempted suicide before, and 17% had attempted suicide during the last week before admission. Among the inpatients who died by suicide, the most common diagnosis was affective disorder (42%), the second highest diagnosis was in the schizophrenia spectrum (27%), and the third highest diagnosis category was "other" (15%). This last category also included patients diagnosed with an *ICD-10* code of X60–X84 (admitted because of self-harm or suicide attempt). In absolute numbers, there were more suicides among patients who were married, who were employed, who were in the lowest income quartile, and who had the lowest educational degree. However, the risk of inpatient suicide was *relatively* higher among patients with the highest income and educational levels.

Figure 1 contains Kaplan-Meier survival curves of the risk of suicide in relation to gender, diagnosis, and admission number, respectively. We chose to show the risk of suicide during the first month because this is when the risk was highest—and in order to be able to graphically specify the differences in gender, diagnosis, and admission number. All the survival curves also had a statistically significant log-rank test.

Table 2 shows that the multivariable analyses found significant associations between social variables and inpatient suicide. Patients who were employed, had the highest educational level, or were married experienced an increased risk of suicide.

In the multivariable analyses testing clinical variables (Table 3), it was found that patients with a primary diagnosis of affective disorder had a significantly higher risk of inpatient suicide compared to patients admitted with substance abuse, schizophrenia, or a stress-related or personality disorder. Having a personality disorder as a secondary diagnosis also significantly raised the hazard ratio (HR) for suicide (1.62; 95% CI, 1.02–2.57) compared to patients without this secondary diagnosis. Both recent and previous suicide attempts were significantly associated with inpatient suicide, both showing high estimates (HR = 4.83 [95% CI, 3.45–6.76] and HR = 1.86 [95% CI, 1.37–2.52], respectively). In relation to the variables measuring clinical outpatient care, the analyses showed that patients who had had contact with a private psychologist within the last year before admission to the psychiatric hospital had a significantly higher risk of inpatient suicide.

Finally, in the univariate analyses among patients admitted more than once (Table 3), it was found that patients readmitted to a psychiatric hospital within 30 days after the last discharge had a significantly higher risk of inpatient suicide (HR = 1.50; 95% CI, 1.13–2.00), but this association is of only borderline significance in the multivariable analyses (HR = 1.34; 95% CI, 0.99–1.81).

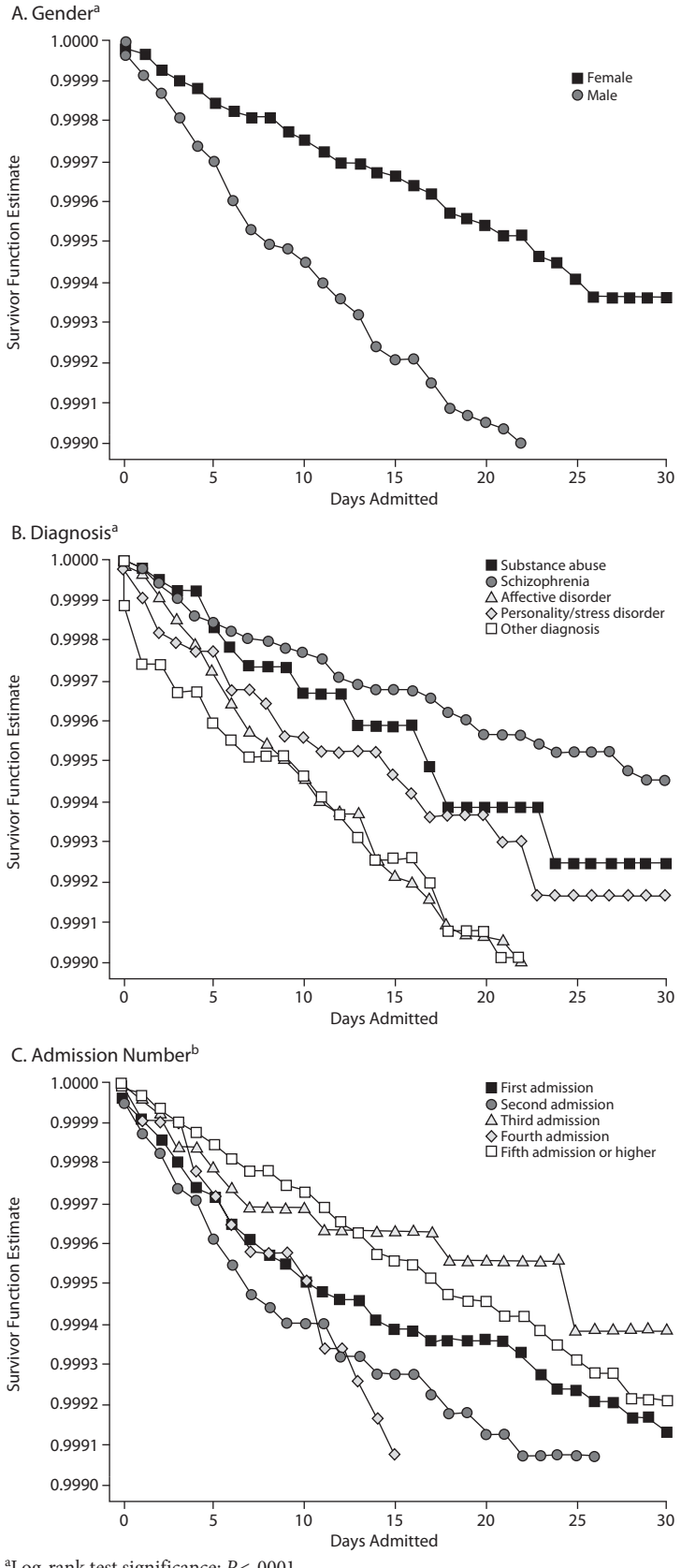
Table 4 shows the results of the multivariable joint analyses. The HR for suicide was 2.58 (95% CI, 2.02–3.31) times higher in male patients than in female patients, and the HR increased by 18% when jumping from one age group to an older age group (1.18; 95% CI, 1.04–1.34). Both labor market status and living status lost statistically significant association with inpatient suicide after adjustment of the clinical variables; only retired persons had a lower HR for suicide compared with employed persons. However, educational level and all the clinical variables kept their statistically significant associations with inpatient suicide when mutually adjusted. Finally, the analyses pointed to a decreasing HR

Table 1. Patient Demographic and Clinical Characteristics by Suicides, Admissions, Inpatients, and Suicides per 100,000 Inpatient Years

Characteristic	Suicides, n (%)	Admissions, no.	Inpatients, n	Suicides per 100,000 Inpatient Years
Total	279 (100)	356,712	126,382	860
Sex				
Female	102 (37)	184,836	66,243	601
Male	177 (63)	171,876	60,139	1,146
Age index, y				
<31	40 (14)	74,539	25,772	472
31–40	69 (25)	79,706	23,146	977
41–50	63 (23)	79,310	24,508	1,038
51–60	52 (19)	56,053	20,281	1,138
>60	55 (20)	67,104	32,675	879
Labor market status				
Employed	123 (44)	109,454	45,766	1,294
Unemployed	40 (14)	60,334	22,826	680
Early retirement	73 (26)	121,362	28,556	694
Retired	42 (15)	60,899	27,408	695
Unknown	1 (0.4)	4,663	1,826	207
Income				
Lowest quartile	149 (53)	209,614	61,919	791
Second quartile	44 (16)	68,907	27,640	696
Third quartile	47 (17)	41,500	19,164	1,230
Highest quartile	37 (13)	30,915	15,285	1,322
Unknown	2 (0.7)	5,776	2,374	301
Education				
Primary school	99 (35)	176,179	57,304	623
Secondary school	29 (10)	25,855	8,006	1,011
Vocational training	77 (28)	86,085	32,818	1,066
Bachelor's degree or higher	59 (21)	34,756	12,733	1,936
Unknown	15 (5)	33,837	15,521	440
Living status				
Married/cohabiting	116 (42)	113,603	47,600	1,320
Living alone/not married	107 (38)	151,524	44,821	676
Divorced/widowed	54 (19)	85,936	31,845	743
Other	2 (1)	5,649	2,116	361
Admission diagnosis				
Substance abuse	14 (5)	58,114	20,733	628
Schizophrenia	75 (27)	113,621	25,294	513
Affective disorder	116 (42)	88,857	33,970	1,447
Personality/stress disorder	32 (11)	59,894	27,363	893
Other diagnosis	42 (15)	36,226	19,022	1,055
Secondary diagnosis				
Substance abuse				
Yes	35 (13)	50,063	14,041	858
No	244 (87)	306,649	112,341	861
Affective disorder				
Yes	9 (3)	11,091	3,979	994
No	270 (97)	345,621	122,403	856
Personality disorder				
Yes	20 (7)	15,521	4,983	1,505
No	259 (93)	341,191	121,399	833
Suicide attempt				
Yes	117 (42)	118,712	29,708	959
No	162 (58)	238,000	96,674	832
Suicide attempt, recent				
Yes	48 (17)	21,249	7,777	3,185
No	231 (83)	335,463	118,605	747
Private psychiatrist				
Yes	33 (12)	30,663	11,684	1,173
No	246 (88)	326,049	114,671	831
Private psychologist				
Yes	13 (5)	7,912	3,605	1,989
No	266 (95)	348,800	122,750	837
Admission type				
Acute admission	250 (90)	321,188	111,465	928
Planned admission	29 (10)	35,368	14,860	529
Admission terms				
Voluntary	261 (94)	331,621	116,710	912
Compulsory detainment	10 (3)	17,727	7,682	464
Judicial detainment	8 (3)	7,349	1,985	486
Psychiatric outpatient				
Yes	41 (15)	46,580	23,934	772
No	238 (85)	310,132	102,421	878
Time since last discharge[a]				
≤30 days	75 (35)	82,050	15,191	993
>30 days	137 (65)	190,815	58,501	792

[a]Estimated only for patients with more than 1 admission.

Figure 1. Kaplan-Meier Survival Curves of the Risk of Suicide During the First 30 Days of Admission in Relation to (A) Gender, (B) Diagnosis, and (C) Admission Number



[a]Log-rank test significance: $P < .0001$.
[b]Log-rank test significance: $P < .003$.

(0.94; 95% CI, 0.90–0.99) for suicide each year over the 10-year period studied.

Patients with an affective diagnosis generally had the highest HR for suicide compared to patients with a diagnosis in the schizophrenia spectrum and those with substance abuse or with stress-related or personality disorders. Not unexpectedly, patients with an earlier suicide attempt (HR = 1.90; 95% CI, 1.40–2.58) or a recent suicide attempt (HR = 4.99; 95% CI, 3.57–6.96) had higher risks for completing suicide. Having had a consultation with a private psychologist during the year before admission increased the risk of suicide (HR = 1.85; 95% CI, 1.05–3.28).

DISCUSSION

In this study, we found that the risk of suicide was very high among psychiatric inpatients, with an estimated 860 suicides per 100,000 inpatient years (compared to the estimated 11.9 suicides per 100,000 person years in the total population in Denmark[38]); however, inpatient suicide was also a very rare event in Denmark during the period from 1997 through 2006—in only 0.08% of all admissions did a suicide occur. In brief, the results showed significant associations between inpatient suicide and sociodemographic covariates such as sex, age, labor market status, gross income, and educational level, as well as clinical markers such as primary diagnosis, a secondary diagnosis of personality disorder, previous and recent suicide attempt, and private psychological treatment. Importantly, we found that the inpatient suicide rate significantly decreased about 6% each year during this 10-year period.

Predicting inpatient suicide is difficult because suicide is a very rare event and, as acknowledged by others, many patients will never attempt or complete suicide,[16,21,39] even when 1 or more risk factors are present. We reported a lower inpatient suicide rate, with 78 per 100,000 admissions, than other studies, in which the rate was reported to be between 101 and 269 per 100,000 admissions.[14–16,21,24]

The analysis showed a decreasing inpatient suicide rate from 1997 through 2006: in the same period, the suicide rate decreased in the general population in Denmark from 18 suicides per 100,000 inhabitants in 1995 to 11 in 2008.[40] Regrettably, we do not know how much of the decrease in the general suicide rate is explained by the decrease in inpatient suicide. Generally, in Denmark, the focus on suicide prevention has increased during the last decade, which could be one explanation of the fall of the inpatient suicide rate, or the rate decrease could be explained by better medical and/or psychotherapy treatment of psychiatric inpatients.

Our results on predictors of suicide support findings from other studies. Like other studies,

Table 2. Univariate and Multivariable Associations Between Social Covariates and Suicide Among Psychiatric Inpatients[a]

Social Covariate	Univariate Association, Hazard Ratio (95% CI)	Multivariable Association,[b] Hazard Ratio (95% CI)
Labor market status		
Employed	1	1
Unemployed	0.58 (0.40–0.83)	0.70 (0.48–1.01)
Early retirement	0.65 (0.47–0.89)	0.71 (0.50–0.99)
Retired	0.55 (0.39–0.79)	0.49 (0.32–0.74)
Income		
Highest quartile	1	1
Third quartile	0.95 (0.62–1.46)	1.08 (0.70–1.67)
Second quartile	0.56 (0.36–0.87)	0.69 (0.44–1.08)
Lowest quartile	0.71 (0.49–1.02)	0.85 (0.57–1.29)
Unknown	0.28 (0.07–1.16)	1.36 (0.08–23.5)
Education		
Bachelor's degree or higher	1	1
Vocational training	0.55 (0.39–0.77)	0.57 (0.40–0.81)
High school	0.58 (0.37–0.91)	0.77 (0.48–1.24)
Primary school	0.35 (0.25–0.48)	0.45 (0.31–0.64)
Unknown	0.24 (0.13–0.42)	0.32 (0.18–0.59)
Living status		
Married/cohabiting	1	1
Living alone/not married	0.63 (0.48–0.82)	0.71 (0.52–0.96)
Divorced/widowed	0.61 (0.44–0.84)	0.71 (0.50–0.99)
Other	0.33 (0.08–1.34)	0.94 (0.06–15.1)

[a]Value of 1 indicates reference group.
[b]Adjusted for sex, age group, and calendar year.

Table 3. Univariate and Multivariable Analyses of Clinical Care and Suicide Attempt as Predictors of Suicide Among Psychiatric Inpatients[a]

Characteristic	Univariate Analysis, Hazard Ratio (95% CI)	Multivariable Analysis,[b] Hazard Ratio (95% CI)
Admission diagnosis		
Affective disorder	1	1
Substance abuse	0.40 (0.23–0.70)	0.29 (0.17–0.52)
Schizophrenia	0.44 (0.32–0.59)	0.45 (0.32–0.63)
Personality/stress disorder	0.60 (0.40–0.88)	0.55 (0.36–0.83)
Other	0.84 (0.58–1.21)	0.88 (0.60–1.30)
Secondary diagnosis		
Substance abuse		
No	1	1
Yes	1.11 (0.78–1.59)	0.92 (0.64–1.33)
Affective disorder		
No	1	1
Yes	1.06 (0.54–2.05)	1.18 (0.61–2.28)
Personality disorder		
No	1	1
Yes	1.72 (1.09–2.71)	1.62 (1.02–2.57)
Suicide attempt, previous		
No	1	1
Yes	1.36 (1.02–1.82)	1.86 (1.37–2.52)
Suicide attempt, recent		
No	1	1
Yes	4.05 (2.96–5.53)	4.83 (3.45–6.76)
Private psychiatrist		
No	1	1
Yes	1.28 (0.89–1.84)	1.17 (0.81–1.71)
Private psychologist		
No	1	1
Yes	2.09 (1.19–3.65)	2.18 (1.23–3.87)
Psychiatric outpatient		
No	1	1
Yes	0.81 (0.57–1.16)	0.88 (0.62–1.25)
Admission type		
Acute admission	1	1
Planned admission	0.66 (0.45–0.97)	0.74 (0.50–1.08)
Admission terms		
Voluntary	1	1
Compulsory detainment	0.55 (0.29–1.03)	0.68 (0.35–1.29)
Judicial detainment	0.88 (0.43–1.79)	0.76 (0.37–1.59)
Time since last discharge[c]		
>30 days	1	1
≤30 days	1.50 (1.13–2.00)	1.34 (0.99–1.81)

[a]Value of 1 indicates reference group.
[b]Adjusted for sex, age group, and calendar year.
[c]Estimated only for patients with more than 1 admission.

we found that male patients had a higher risk of psychiatric inpatient suicide[39] and that the ratio between male and female patients who died by suicide was smaller among psychiatric inpatients compared with the ratio in the general population.[19,41] We also found, as in other studies, that more patients with an affective diagnosis died by suicide compared to patients with other diagnoses,[9,18,22,42] although a few studies found that more patients with a schizophrenia diagnosis died by suicide.[42,43] In addition, we found that patients admitted within the diagnostic category of "other" did not differ in their risk of suicide compared to patients with an affective disorder. This finding is probably explained by the fact that patients admitted with an *ICD-10* code of X60–X84 (admission because of self-mutilation and suicide attempt) were part of the "other" diagnosis category, and these patients probably constituted an inpatient suicidal high-risk group. In relation to our results on secondary diagnosis, we found that having a substance abuse or affective disorder did not significantly predict suicide, but having a personality disorder did increase suicide risk. To our knowledge, others have not examined personality disorder as a secondary diagnosis before.

As found in a few other studies,[17,44] some of the social covariates had a reverse association with suicide in psychiatric patients compared with the general population. Having a job, being in the highest income group, or having a higher educational level increased the risk of suicide in admitted psychiatric patients. It has been discussed whether this reverse association can be explained by the possibility that patients who used to cope well suddenly find themselves in a stressful situation and are afraid of losing income and employment.[44] In relation to inpatient suicide prevention, this reverse association between suicide and social variables among psychiatric patients is important for informing psychiatric health personnel, while it should also be kept in mind that, in absolute numbers, more patients with low educational level and in the lowest income group die by suicide.

Receiving private psychological treatment was a risk factor for inpatient suicide. This association could be explained by the possibility that patients who already have a suicidal predisposition *before* admission seek contact with a psychologist to a significantly higher extent. This scenario is likely since a Danish citizen can get a referral with cost subsidy to a private psychologist via the public health insurance system *if* they have had a suicide attempt.

Table 4. Multivariable Associations (joint analyses) of Social Variables, Suicide Attempt, and Clinical Care With Suicide Among Psychiatric Inpatients[a]

Characteristic	Multivariable Associations, Hazard Ratio (95% CI)
Sex	
Female	1
Male	2.58 (2.01–3.31)
Age	
Age group	1.18 (1.04–1.33)
Calendar time, y	
1997–2006	0.94 (0.90–0.99)
Labor market status	
Employed	1
Unemployed	0.77 (0.53–1.11)
Early retirement	0.80 (0.56–1.14)
Retired	0.50 (0.32–0.78)
Education	
Bachelor's degree or higher	1
Vocational training	0.54 (0.39–0.77)
High school	0.77 (0.48–1.24)
Primary school	0.41 (0.29–0.60)
Unknown	0.31 (0.16–0.57)
Living status	
Married/cohabiting	1
Living alone/not married	0.84 (0.62–1.14)
Divorced/widowed	0.76 (0.55–1.07)
Other	0.95 (0.06–15.0)
Admission diagnosis	
Affective disorder	1
Substance abuse	0.32 (0.18–0.57)
Schizophrenia	0.53 (0.38–0.75)
Personality/stress disorder	0.61 (0.40–0.91)
Other	1.15 (0.78–1.72)
Secondary diagnosis	
Personality disorder	
No	1
Yes	1.60 (1.01–2.53)
Suicide attempt, previous	
No	1
Yes	1.91 (1.40–2.58)
Suicide attempt, recent	
No	1
Yes	4.99 (3.57–6.96)
Private psychologist	
No	1
Yes	1.85 (1.05–3.27)

[a]Value of 1 indicates reference group.

Methodological Issues

As established in many other studies, we found that earlier suicidal behavior significantly predicted inpatient suicide. Suicidal behavior in this study constituted a record of a patient's last admission to the hospital because of suicide attempt. If some patients were to have a suicide attempt without a hospital admission, this predictor would be underestimated in our results. However, if some patients were registered with a suicide attempt but were admitted due to self-mutilation (with no intention to die) this fact would result in an overestimation of suicide attempt as a predictor.

Another methodological issue was how to define this national cohort study. We chose to include all psychiatric admissions from 1997 through 2006; therefore, some patients included in this cohort had already been admitted before 1997 and thereby had survived the elevated risk of suicide in the first year after first admission.[45] This choice means that the results would be affected by underestimation. To avoid this result, the rational choice would have been to include *only* patients who had their first admission in the years 1997–2006, but this choice would have compromised the power a great deal since the number of events would have been reduced. Alternatively, we could have chosen a larger time period for the study, but many of the covariates that we wanted to test as predictors were not recorded before 1995.

The advantages of this study are that it is the first national cohort study of psychiatric inpatient suicide, and, to our knowledge, it is also the study that includes the highest number of suicides (N = 279) in comparison to previous case-control studies. This study, however, also has its limitations: for example, we used only national register-based information, which does not cover data more closely related to the psychiatric inpatients, such as information from case notes. As a consequence, this study offers limited clinical assistance during patient assessment because the examined risk factors are relatively common. Likewise, the sociodemographic covariates were recorded during the year before admission, so the results may be affected by an unregistered loss of job or income or an unregistered change in marital status that occurred during the time before hospital admission.

To summarize the conclusions from this study, we suggest drawing health personnel's attention to the found risk factors, especially those risk factors that are the reverse of suicide risk factors in the general population. At the same time, we must emphasize the importance of screening patients for suicidal predisposition during the first days of admission, when the risk of inpatient suicide is highest.

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