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Frequent psychiatric admissions and the risk of suicide: a prospective total cohort study 2005–2023

Ane Askeland Buer[a], Maria Fagerbakke Strømme[b,c], Marit Schmid[a,d], Anne-Siri Fismen[e], Rolf Gjestad[b,f] and Mette Senneseth[a,f]

[a]Department of Welfare and Participation, Western Norway University of Applied Sciences, Bergen, Norway; [b]Research Department, Division of Psychiatry, Haukeland University Hospital, Bergen, Norway; [c]Mohn Research Centre for Psychotic Disorders, Haukeland University Hospital, Bergen, Norway; [d]Division of Psychiatry, Haukeland University Hospital, Bergen, Norway; [e]Department of Health and Caring Sciences, Western Norway University of Applied Sciences, Bergen, Norway; [f]Centre for Research and Education in Forensic Psychiatry, Haukeland University Hospital, Bergen, Norway

ABSTRACT

Purpose: Discharge from a psychiatric hospital is associated with an elevated risk of suicide. Previous studies have linked a higher number of psychiatric admissions to suicide risk. However, findings are mixed, and the association between admission frequency and suicide risk remains unclear. This study aimed to investigate whether frequent psychiatric admissions and the persistence of readmission patterns serve as risk factors for suicide.

Methods: This prospective total cohort study included all patients consecutively admitted to the psychiatric acute ward at Haukeland University Hospital in Bergen, Norway, between 2005 and 2014 (N = 7000). The cohort was divided into independent groups according to the number of admissions per year and the persistence of this pattern. Demographic and clinical data were collected at each admission. Patients were followed for up to 19 years by linking the cohort to the Norwegian Cause of Death Registry. Cox and competing risk regression analyses were applied to investigate the association between the frequency of admissions and the risk of suicide.

Results: There was an approximately threefold (AHR = 2.91) increase in the risk of suicide in patients with five or more admissions on average per utilisation year, when adjusted for gender, suicidal ideation, self-harm and diagnosis. The risk was particularly high (AHR = 5.93) immediately after the last discharge.

Conclusions: These findings might assist the identification of a subgroup of individuals at particular risk of suicide within a population of hospitalised psychiatric patients.

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suicide; psychiatric acute wards; frequent admissions; suicide risk; revolving door patients

Introduction

It is widely documented that the risk of suicide is elevated after discharge from a psychiatric hospital [1,2]. This risk is particularly pronounced in the immediate time following discharge [2,3]. However, the risk of suicide has been found to remain elevated for many years [2].

Suicide mortality is a complex phenomenon, and a wide range of factors have been identified as risk factors [4]. Notably, the presence of any mental disorder is strongly associated with suicide, including depression, bipolar disorder, emotionally unstable personality disorder (EUPD), schizophrenia spectrum disorder and substance use disorder [5,6]. Furthermore, suicidal ideation, self-harm, and suicide attempts are documented suicide risk factors [7–10]. While studies have found that males have higher rates of suicide deaths [11], females show higher rates of suicidal ideation and attempts [12,13].

A recent meta-analysis found that samples of first-time admission patients have lower post-discharge suicide rates than mixed samples, suggesting that readmissions may be an important suicide risk factor [2]. Repeated admissions and discharges from psychiatric hospitals are a significant challenge in clinical psychiatry. This phenomenon, often referred to as the 'Revolving Door phenomenon', is commonly defined by three or more admissions in 12 months [14,15]. Higher admission rates have been associated with worse prognosis and long-term outcomes for the patients [14,16]. Due to the repeated exposure to vulnerable post-discharge periods for those frequently admitted [17,18], these patients may be at particular risk of suicide.

While some studies link a higher number of admissions to increased suicide risk [3,19–21], these studies only consider the total number of previous admissions over extended periods. There is limited evidence on whether persistent patterns of frequent admissions (FAs), or concentration of admissions within a defined period, are associated with suicide risk. Moreover, a recent systematic review [22] found mixed evidence regarding the association between the number of

CONTACT Ane Askeland Buer anabu@hvl.no Western Norway University of Applied Sciences (Høgskulen på Vestlandet), P.O. Box 7030, 5020 Bergen, Norway
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prior admissions and the risk of suicide in the first year after discharge. Consequently, the relationship between the frequency and persistence of admissions, and the risk of suicide remains unclear, highlighting the need to explore the association of repeated admissions with serious adverse outcomes [21], such as suicide.

There is an ongoing debate regarding the potential iatrogenic effects of psychiatric hospitalisation on suicide risk [23,24]. Setting that debate aside, the present study examines whether the frequency of hospital admissions is associated with suicide risk independently of other established factors. Clarifying this association could indicate whether admission frequency functions as a clinically relevant marker of elevated suicide risk. If so, it may support efforts to identify a subgroup of individuals who require targeted prevention strategies.

Objective

The present study aimed to investigate whether frequent psychiatric admissions and the persistence of readmission patterns serve as risk factors for suicide, after adjusting for established risk factors such as gender, diagnosis, suicidal ideation, and self-harm. Based on the existing literature, we hypothesised that more FAs and persistent high-frequency patterns are associated with an elevated risk of suicide.

Methods

Study design

This study is a prospective total cohort study and a sub-study of the Suicidality in Psychiatric Emergency Admissions (SIPEA-II) study [19], which investigates mortality and suicidality among patients receiving acute psychiatric treatment at the Psychiatric Division of Haukeland University Hospital in Norway.

Setting

The SIPEA-II database comprises all consecutively admitted patients (N = 7000) to the psychiatric acute unit between May 2005 and July 2014, resulting in a total of 18,909 acute admissions. During the data collection period, Haukeland University Hospital served approximately 95% of all patients requiring acute psychiatric hospitalisation in a catchment area of approximately 400,000 inhabitants, where there are no privately run acute inpatient facilities. Detailed information on the SIPEA-II material and methods is available elsewhere [25–27].

Participants

The sample in the present sub-study comprised all patients (N = 7000) from the SIPEA-II cohort. Thirty-one individuals could not be found in the registry due to a lack of a person identification number. As a result, the statistical analyses on suicide risk were conducted on a sample size of n = 6969.

Data source

Data from the SIPEA-II database were made available for the research team in November 2023 and were linked with data on death and causes of death from the Norwegian Cause of Death Registry in 31 December 2023. Follow-up time for each patient was unique and was assessed from their index (first) admission to 31 December 2023. Mean follow-up time for patients in the present sub-study was 10.52 years, standard deviation (SD) = 4.81 (median = 11, range = 0–18). In the SIPEA-II study, sociodemographic and clinical data were gathered through clinical interviews at the index (first) admission and at each consecutive readmission. The assessments were conducted by experienced intake clinicians, using all available information from the referral physician. Suicidal ideation and self-harm were assessed through questions relating to whether patients had, prior to admission, experienced any suicidal ideation or engaged in any self-harm. Primary and, when appropriate, secondary and tertiary diagnoses according to ICD-10 were provided by the clinician in charge at each admission, as part of the routine clinical assessment.

Measurements

Independent variables

In the present sub-study, the primary independent variable was the frequency of hospital admissions and the persistence of hospital admission patterns. To define this variable, the first step was to identify patients with three or more admissions during any utilisation year as meeting the criterion for FAs (n = 1100), in accordance with previous literature [14,15,28]. A utilisation year was defined as any 12 months (date-to-date) within the individual's utilisation period. The utilisation period was defined as the time between a patient's first admission (index) and their last discharge within the SIPEA data collection (2005–2014). Utilisation periods shorter than one year were rounded up to one full year.

Patients who did not meet the criterion of FAs any utilisation year were defined as the reference group (non-FA) (n = 5900) (Figure 1).

To further differentiate FA patients based on the intensity and persistence of their admission patterns, we calculated the average number of admissions per utilisation year for each individual.

Based on this, FA patients were grouped into three subcategories according to the frequency of admissions per utilisation year and the persistence of this pattern:

1. Patients with occasional frequent admissions (occasional FA): three or more admissions within 12 months, occurring at least once during the utilisation period (n = 778).
2. Patients with highly frequent admissions (high FAs): an average of more than three but less than five admissions per utilisation year across the utilisation period (n = 223).
3. Patients with extremely high frequent admissions (extremely high FAs): an average of five or more admissions per utilisation year across the utilisation period (n = 99).

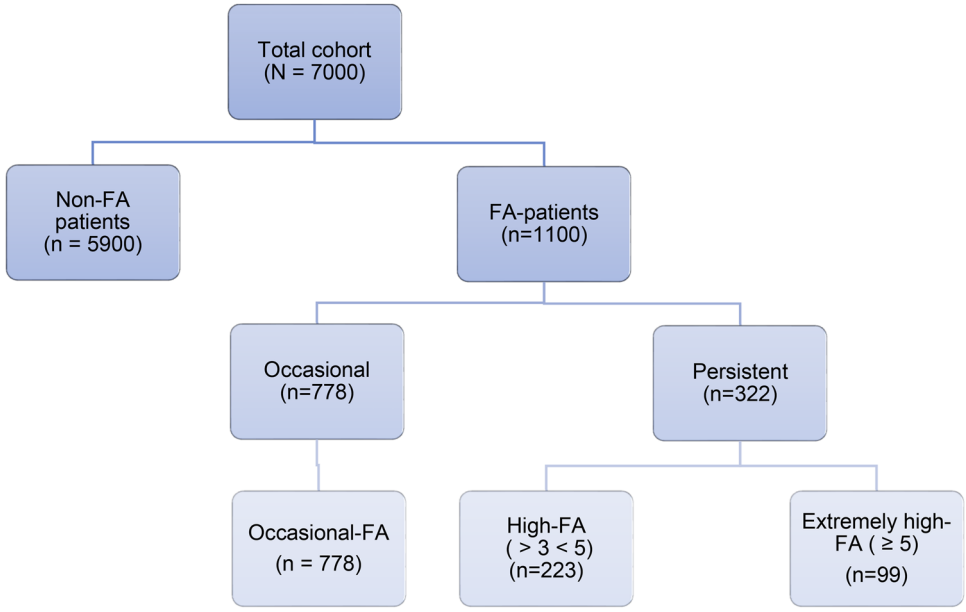

Figure 1. Flow diagram of the grouping process. FA: frequent admissions; occasional FA: patients with three or more admissions within 12 months, at least once during the utilisation period; high FA (>3 < 5): patients with an average of more than three and less than five admissions per utilisation year across the utilisation period; extremely high FA (≥5): patients with an average of five or more admissions per utilisation year across the utilisation period.

Although no standardised cut-offs for the high and extremely high FA groups have been established in the existing literature, this approach was informed by evidence that FAs are often episodic and non-persistent rather than stable over time [29]. To investigate risk factors related to the Revolving Door phenomenon, Di Lorenzo et al. [28] applied the criterion of three admissions per year to identify their 'revolving door patients', and then divided this group based on a median of five admissions across the entire observation period. In contrast, the present study used the mean number of admissions per utilisation year to capture both annual frequency and persistence, enabling differentiation between occasional episodes of FAs and consistently high-frequency patterns.

To validate the FA-group variable, several indicators reflecting hospital admission history were constructed, including time between admissions, timing of admissions within the utilisation period, length of stay (LoS) in acute wards and across departments, and number of admissions per utilisation year (see Appendix for details). Using ordinal regression, we found that higher FA-group membership was associated with a steeper increase in admissions over time, later average timing of admissions, more tightly clustered admissions, longer and more consistent intervals between admissions, and a higher annual admission rate. LoS variables were not statistically significant in the initial model, which explained 80% of the variance in FA-group classification (McFadden index).

After iteratively removing non-significant predictors, the final model retained the same explanatory power and showed that greater variability in LoS in acute wards was associated with higher FA-group scores. These findings indicate that FA-groups are effectively represented by other existing variables that depict various facets of admission history over time. Due to substantial overlap, these variables cancelled each other out when included together in survival models predicting risk of suicide (see Appendix), further supporting the validity of the FA-group construct. Bivariate correlations showed the strongest association between the FA-group and the slope factor, indicating that higher FA-categories are characterised by a pronounced increase in admissions over time.

Secondary independent variables were gender, suicidal ideation, self-harm and psychiatric diagnosis (ICD-10), at last admission. The most recent diagnosis recorded at the last admission, whether in PAM, a psychiatric hospital ward, or a District Psychiatric Centre, was used. Diagnoses were presented as *Substance use disorders* (F10.0–F19.9), *Psychotic disorders* (F20–F29), *Affective disorders* (F30–F39), *Neurotic disorders* (F40–F48) and *Disorders of adult personality and behaviour* (F60–F69). *Emotionally unstable personality disorder (F60.3)* was also included as a separate predictor. The diagnoses were made by the clinician in charge as part of routine clinical practice, thereby preventing inter-rater reliability analyses. Suicidal ideation refers to thoughts of dying, that is, as a passive death wish without suicidal thoughts, as suicidal thoughts without a concrete suicide plan, or as suicidal thoughts with concrete suicide plans. Self-harm refers to deliberate self-harm, either with no or little intent to die (non-suicidal self-harm) or with high or sure intent to die (suicide attempt).

Dependent variable

The dependent variable was time-to-suicide. Patients who died of causes other than suicide were censored at the date of their death, and those still alive at the end of the follow-up period were right-censored as of 31 December 2023. The time variable was set at zero at the last admission. Only certain suicides were included (EU shortlist: X60-X84, Y870).

Statistical analyses

The statistical analyses were performed using SPSS version 29 (Chicago, IL) [30] and STATA version 18 (College Station, TX) [31]. Descriptive analyses were reported with means and SDs, as well as medians (e.g. number of admissions), ranges and frequencies.

To investigate the association between the frequency of admissions and the risk of suicide, two Cox regression analyses were performed, the first with main effects only and the second including time-dependent predictors [32]. These time-dependent predictors also tested the assumption of proportional hazard. Risk of suicide refers to the estimated likelihood that an individual will die by suicide in any individual interval, given that the person has survived the previous intervals.

In addition to the FA groups, gender, suicidal ideation, self-harm, and diagnoses at last admission were included as predictors in both analyses. Adjusted hazard rates (AHRs) were estimated and reported with 95% confidence intervals. Levels of <0.05 were considered statistically significant. A sensitivity analysis was conducted using competing risk (CR) models, incorporating main-effect and time-dependent predictor models. The time-dependent relations were small, supporting hazard proportionality. Multicollinearity between the predictor variables was not found to be problematic, with the lowest tolerance being 0.75, which is far above the threshold of 0.10.

To investigate whether measures of suicidal ideation and self-harm at the last admission served as adequate predictors in the Cox regression analyses, GLMM analyses were applied to test whether these predictors were stable over time. Results showed reasonable stability, thus indicating no need to represent changes in suicidal ideation and self-harm as separate predictors in the survival models (see Supplementary Tables 1 and 2).

Ethics

All procedures undertaken during this work comply with the ethical standards of the Helsinki Declaration of 1975 (revised in 2013) and the national and institutional committees on human experimentation. The SIPEA-II study was approved by the Norwegian Directorate of Health, the Norwegian Social Science Data Service, and the Regional Committee for Medical Research Ethics (reference number REK 46004). The above-mentioned bodies also authorised the use of patient information without informed consent. To ensure confidentiality, all identifiable personal information was removed from the dataset made available for the present study.

Results

Cohort description

Table 1 outlines the characteristics of the cohort. The utilisation periods (the period from first admission to last discharge) ranged from 1 to 9.9 years, with a mean number of utilisation years of 2.0 (SD 1.99) in the total cohort. The mean number of years was highest in the occasional FA group (4.3 years) and shortest in the non-FA group (1.6 years). The mean number of admissions per utilisation year was 1.4 in the total cohort, 1.1 in the non-FA group, 2.0 in the occasional FA group, 3.8 in the high FA group, and 7.1 in the extremely high FA group.

During the study period (2005–2023), a total of 1811 deaths were recorded (n = 6969). Of these deaths, 224 were suicides. Refer to Table 1 for the distribution across groups. The mean age at suicide differed by gender, 44.9 for females (SD 14.5) and 40.8 for males (SD 15.3) (p = 0.047). Lower age at suicide was found in the extremely high FA group (mean = 27.1 years, SD 10.5) compared to that of the other groups ($F(3)$ = 3.51, p = 0.016) (Table 1).

The association between the frequency of admissions and suicide

The first step (model 1 in Table 2) in the Cox regression analysis, which included the group predictors, identified a higher risk of suicide in the extremely high FA (≥5) group compared to the reference group (AHR = 2.99; 95% CI 1.47–6.07). The next step, which included gender (model 2), showed that the association between the extremely high FA (≥5) group and suicide remained statistically significant, with a slight increase in the risk estimate (AHR = 3.15; 95% CI 1.55–6.40). The final step (model 3), which included self-harm, suicidal ideation and diagnoses as predictors, still confirmed the same association between the extremely high FA (≥5) group and increased risk of suicide (AHR = 2.91; 95% CI 1.35–6.34). The survival curves based on model 3 are shown in Figure 2.

The second Cox regression analysis added the predictors as time-dependent predictors (Table 3). Immediately after the last discharge, there was an approximately sixfold increase in the risk of suicide for the extremely high FA (≥5) group (AHR = 5.39; 95% CI 2.28–15.40). The predictors of male gender, self-harm, suicidal ideation, and affective and psychotic disorders also increased the risk of suicide immediately after discharge. For males, self-harm and psychotic disorders, there were minor reductions in the risk of suicide over time. The relations for the other predictors remained stable over time. The sensitivity CR model (not presented), which accounted for the likelihood of dying from other causes, showed some reduction in the estimates of the relation between male gender and suicide (AHR = 1.34, p = 0.053). However, the other relations, including that of the extremely high FA (≥5) group, remained statistically significant.

Discussion

The present study aimed to investigate whether FAs and the persistence of readmission patterns serve as risk factors for suicide. Results showed that patients with an average of five or more admissions per utilisation year (extremely high FA) had a three times higher risk of suicide compared to those not frequently admitted. In addition, this extremely high FA group showed an approximately sixfold increase in the risk of suicide immediately after the last discharge. By contrast, no

Table 1. Characteristics of the cohort.

	Non-FA (n = 5900)	Occasional FA (n = 778)	High FA >3 and <5 (n = 223)	Extremely high FA ≥5 (n = 99)	Total cohort (N = 7000)
Admissions 2005–2014[a]					
Total	9150	5437	2279	2043	18,909
Mean (SD)	1.6 (1.0)	7.0 (4.3)	10.2 (9.6)	20.6 (30.3)	2.7 (5.3)
Median (range)	1 (1–9)	6 (3–25)	5 (4–45)	9 (5–189)	1 (1–189)
Utilisation period					
Mean no. of years (SD)	1.6 (1.6)	4.3 (2.8)	2.7 (2.4)	2.5 (2.4)	2.0 (2.0)
Median	1.0	3.8	1.5	1.1	1.0
Admissions per utilisation year					
Mean (SD)	1.1 (0.4)	2.0 (0.8)	3.8 (0.5)	7.1 (2.8)	1.4 (1.0)
Median	1.0	1.9	3.9	6.0	1.0
Age at index admission					
Mean (SD)	42 (18.1)	39 (15.4)	39 (15.4)	31 (12.6)	42 (17.7)
Gender %					
Females	46.4	45.6	50.7	62.6	46.7
Diagnosis %[b]					
Substance use disorder	30.1	48.2	47.1	50.5	32.2
Psychotic disorder	22.1	53.9	44.4	32.3	25.6
Affective disorder	43.2	55.4	56.1	54.5	45.2
Neurotic disorder	27.9	37.1	39.9	49.5	29.6
Personality disorder[c]	5.6	23.3	28.7	50.5	9.0
EUPD	2.4	10.7	19.3	39.4	4.4
Suicidal ideation and self-harm[d]*%*					
No ideation	38.5	43.3	34.6	17.3	37.1
Passive ideation	10.7	8.9	7.7	6.4	9.3
Suicidal thoughts	16.5	16.5	19.0	15.3	16.7
Suicidal plans	14.9	14.4	16.4	18.1	15.3
Self-harm[e]	8.2	7.2	12.9	32.0	11.1
Suicide attempt	7.2	5.4	5.9	8.9	6.7
Unknown	4.0	4.3	3.5	1.9	3.8
Suicides, n (%)	176 (3.0)	30 (3.9)	10 (4.5)	8 (8.1)	224 (3.2)
Males	108	19	6	1	134
Female	68	11	4	7	90
Age at suicide (SD)	43 (15.2)	41 (14.1)	48 (13.3)	27 (10.5)	42 (15.1)
Survival days[f]					
Mean (SD)	1248 (1443.7)	1011 (1443.7)	1502 (1314.5)	245 (286.6)	1192 (1428.3)
Median	605.5	304.0	1361.0	141.5	503.5

[a]Overall admissions during the observation period.
[b]Percentage of patients who have received the diagnosis at one point during the study period (more than one diagnosis is possible).
[c]Disorder of adult personality and behaviour, excluding emotionally unstable personality disorder (EUPD), which is shown separately in the row below.
[d]Suicidal ideation and self-harm present at admission (n = 18,394 admissions, 2.72% missing values).
[e]Non-suicidal self-harm.
[f]Number of days between last discharge and suicide.

statistically significant associations were found when comparing the other FA groups to the non-FA reference group. These findings support the study's hypothesis that more FAs with persistent high-frequency patterns are associated with an elevated risk of suicide. These findings represent an important contribution to the literature by identifying a subgroup, albeit small, with a particular risk of suicide within a population of hospitalised psychiatric patients.

This is the first study that explores this association by not only identifying the frequency of admissions but also the concentration of admissions, based on the average number of admissions per utilisation year. While other studies [3,19–21] have found an association between the number of admissions and the risk of suicide, they have done so by examining the number of previous admissions over more extended periods. The present findings, however, suggest that individuals with an average of five or more admissions in one year may be at a higher risk of suicide than a person with five admissions over several years. The extremely high FA group variable remained independently associated with elevated suicide risk across all models after holding constant the statistical effect of the other predictors. From a clinical perspective, this suggests that group membership explains the varying risk levels among individuals who are otherwise comparable on the included predictors. Hence, this may represent individuals at risk who require extra attention.

Consistent with findings reported in previous research [7,9,22], both suicidal ideation and self-harm were associated with a higher risk of suicide in this study. This highlights that suicidal ideation and self-harm are important clinical symptoms to address at admission. Similarly, the diagnostic category of affective disorders was identified as a significant factor, also consistent with previous studies [6].

The immediate periods following discharge have been documented as an exceptionally vulnerable phase concerning the risk of suicide among all admitted patients [2,3,33]. Adding to this, findings from this study suggest that patients with an average of five or more admissions per utilisation year may face an even higher risk during this immediate period compared to patients without repeated admissions.

Notably, the mean age at the time of the suicide was significantly lower for those with an average of five or more admissions per utilisation year, compared to those in the other groups. Considering that age at suicide in this group (mean = 27) was lower than the age at index admission (mean = 31), this suggests that younger patients with an

Table 2. Risk factors for suicide (n = 6969).

	AHR	95% CI	p Value
Model 1			
Occasional FA group[a]	1.41	(0.96–2.08)	0.081
High FA (>3 < 5) group[b]	1.63	(0.86–3.08)	0.134
Extremely high FA (≥5) group[c]	2.99	(1.47–6.07)	0.002
Model 2			
Occasional FA group	1.41	(0.96–2.08)	0.083
High FA (>3) group	1.66	(0.88–3.15)	0.118
Extremely high FA (≥5) group	3.15	(1.55–6.40)	0.002
Male	1.37	(1.05–1.79)	0.021
Model 3			
Occasional FA group	1.30	(0.84–1.99)	0.241
High FA (>3 < 5) group	1.44	(0.72–2.89)	0.304
Extremely high FA (≥5) group	2.91	(1.35–6.34)	0.007
Male	1.36	(1.02–1.81)	0.035
Self-harm	1.88	(1.51–2.34)	<0.001
Suicidal ideation	1.29	(1.12–1.47)	<0.001
Substance use disorders	1.31	(0.98–1.75)	0.068
Psychotic disorders	1.24	(0.85–1.82)	0.268
Affective disorders	1.58	(1.17–2.12)	0.003
Anxiety and stress-related disorders	1.02	(0.76–1.37)	0.910
Personality disorders[d]	0.85	(0.53–1.36)	0.499
Emotionally unstable personality disorder	1.15	(0.63–2.10)	0.660

AHR: adjusted hazard ratio (AHR = 1 indicates no association); CI: 95% confidence interval.
[a]Occasional frequent admissions (FA) vs. reference group: non-FA group.
[b]High FA (>3 < 5) vs. reference group: non-FA group.
[c]Extremely high FA (≥5) vs. reference group: non-FA group.
[d]Disorder of adult personality and behaviour, excluding emotionally unstable personality disorder (EUPD), which is shown separately in the row below.

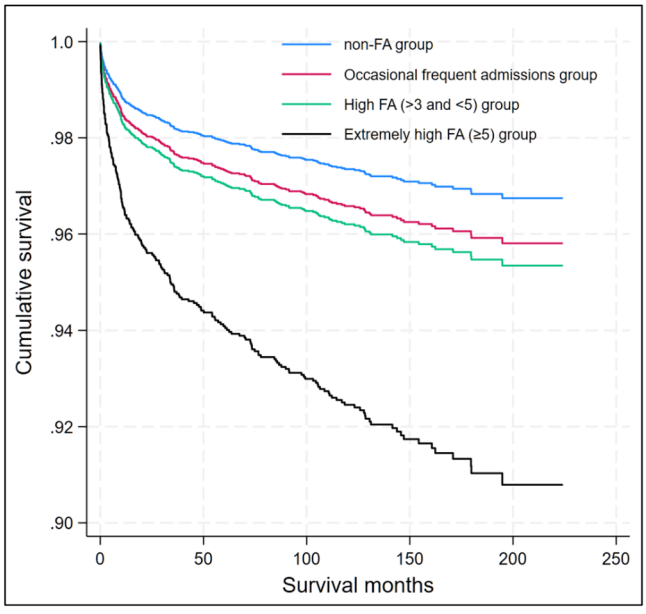

Figure 2. Cumulative monthly survival of the three FA-groups and reference group, based on adjusted estimates from the Cox regression model (model 3) (n = 6969).

average of five admissions per utilisation year may be at particular risk. However, considering the small sub-sample size in this group, these findings need replication in future studies with larger samples.

In the present cohort, each patient's unique utilisation period extended from the index admission to the last discharge within the years 2005–2014. Patients were categorised into groups based on the mean frequency of admissions per utilisation year (date-to-date). Consequently, individuals with

Table 3. Risk factors for suicide, by main predictors and by interaction with time (n = 6969).

	AHR	95% CI	p Value
Immediately after the last discharge			
Occasional FA group[a]	1.22	(0.69–2.14)	0.497
High FA (>3 < 5) group[b]	1.18	(0.46–3.00)	0.729
Extremely high FA (≥5) group[c]	5.93	(2.28–15.40)	<0.001
Male	1.80	(1.22–2.65)	0.003
Self-harm	2.43	(1.82–3.25)	<0.001
Suicidal ideation	1.50	(1.25–1.80)	<0.001
Substance use disorders	1.37	(0.94–2.00)	0.100
Psychotic disorders	1.79	(1.10–2.93)	0.020
Affective disorders	1.72	(1.17–2.52)	0.006
Anxiety and stress-related disorders	1.14	(0.77–1.68)	0.508
Personality disorders[d]	0.80	(0.43–1.47)	0.471
Emotionally unstable personality disorder (EUPD)	1.40	(0.65–3.01)	0.393
Over time			
Time × occasional FA group	1.00	(0.99–1.01)	0.685
Time × high FA (>3 < 5) group	1.01	(0.99–1.02)	0.444
Time × extremely high FA (≥5) group	0.96	(0.90–1.01)	0.142
Time × male	0.99	(0.99–1.00)	0.033
Time × self-harm	0.99	(0.99–1.00)	0.010
Time × suicidal ideation	1.00	(0.99–1.00)	0.009
Time × substance use disorders	1.00	(0.99–1.00)	0.615
Time × psychotic disorders	0.99	(0.98–1.00)	0.030
Time × affective disorders	1.00	(0.99–1.00)	0.417
Time × anxiety and stress	1.00	(0.99–1.00)	0.355
Time × personality disorders[d]	1.00	(0.99–1.01)	0.873
Time × EUPD	1.00	(0.98–1.01)	0.510

AHR: adjusted hazard ratio (AHR = 1 indicates no association); CI: 95% confidence interval; time: monthly change.
[a]Occasional frequent admissions (FA) vs. reference group: non-FA group.
[b]High FA (>3 < 5) vs. reference group: non-FA group.
[c]Extremely high FA (≥5) vs. reference group: non-FA group.
[d]Disorder of adult personality and behaviour, excluding emotionally unstable personality disorder (EUPD), which is shown separately in the row below.

five or more admissions, yet with a utilisation period limited to a single utilisation year, were categorised into the extremely high group. Conversely, individuals with five or more admissions during one utilisation year, but with fewer admissions in other years, may have been masked by a lower average due to more extended utilisation periods. Therefore, it remains uncertain whether the persistent pattern of FAs over multiple utilisation years holds greater significance than FAs confined to a single utilisation year. Nevertheless, the analyses of predictive validity indicated that the FA group variable was a highly relevant primary predictor. It demonstrated correlations with various other admission variables that characterise different levels and patterns of admissions. Future research could investigate the impact of these predictor variables on survival, considering both their role as stable predictors and as time-dependent factors.

Studies show that there is a high frequency of contact with healthcare services in those who die of suicide, especially in the immediate time prior to their death [8,34]. As observed in a recent longitudinal study of patterns of healthcare contacts prior to suicide [8], there appears to be an escalating build-up of help-seeking contacts over time, culminating in an acute crisis. Considering that the grouping criteria are based on annual intervals in this study, it is not possible to conclude that a one-year observation period is sufficient to identify individuals at high risk. It is plausible that five hospitalisations within a shorter timeframe, such as six months, may indicate an even more critical trajectory. This perspective should be followed up on in future studies.

The association of the extremely high FA group variable raises important questions regarding the mechanisms through which admission frequency influences suicide risk. For example, no significant association was found between EUPD and the risk of suicide in the adjusted models in this study. However, this diagnosis, which was more prevalent in the extremely high FA group, has been associated with both high use of medical services [35] and self-harm and suicide [5,36], suggesting that EUPD might have a mediating effect via high use of medical services. Future research could benefit from applying mediation models or structural equation modelling to explore these pathways further.

Furthermore, while including known risk factors for suicide in the survival models, potential residual confounding predictors may have been omitted. For example, a previous study [26] based on the same cohort, found an association between suicide and somatic/physical conditions, as well as marital status [26], which were not considered in the present study. However, widely accepted risk factors for suicide in the community have limited application in populations of discharged psychiatric patients [10] and clinical factors may have limited value in distinguishing between high-risk and low-risk groups at risk of suicide after psychiatric discharge [10]. As such, there was no evident reason to consider them in this context.

It could be argued that the association between the extremely high FA group and suicide is due to confounding by indication. After all, patients with more severe and persistent mental health issues may both be hospitalised more frequently and have a higher risk of suicide [23,37]. This highlights the challenge of separating care utilisation from underlying suicidality or severity of the condition. Suicide is a complex phenomenon [4,10], and the findings from this study are unlikely to indicate a negative influence of hospital care itself, but rather a combination of patient characteristics [6,38], systemic factors such as continuity of care [39,40] and broader social determinants.

Access to mental health care is a central suicide prevention strategy [34,41], and hospital admissions may indeed reflect an appropriate clinical response to elevated suicide risk [37]. However, high rates of contacts can also indicate poor service quality [34] and inadequate support from the health services to address these patients' needs [42]. As Nordentoft et al. [38] argue, most patients are often discharged back into challenging situations that may threaten the stability achieved during their admission. Understanding patterns of admission may help identify individuals with underlying vulnerabilities who are at elevated risk of suicide.

Two recent studies from Norway [43,44] suggest there is a gap in the service system for patients with extensive admissions. Specifically, an analysis of a subsample of patients exhibiting severe self-harming behaviours and extensive psychiatric hospitalisation, revealed a dissatisfaction with available help outside of the hospital, coupled with a lack of trust and a breakdown in the therapeutic alliance within the hospital setting [44]. Similarly, Iversen et al. [43] highlight how community services are often unequipped to provide the necessary structure for a minority of patients, leading to inconsistent care provision across the care continuum. In combination with the results of the present study, these insights suggest the need to enhance the continuity of care to better support patients at risk.

Clinical implications

Despite persistent efforts, predicting suicide at the individual level has shown limited effectiveness [2,45], and it has been suggested that suicide prevention should concentrate on entire cohorts of discharged patients [33]. However, as Prestmo et al. [46] argue, a preliminary step toward prevention involves identifying those individuals at the highest risk within the high-risk population of hospitalised psychiatric patients. This study adds to the current knowledge by focusing on an already established vulnerable group, i.e. patients admitted to psychiatric facilities, and within this group identifies those who may be at an even greater risk of suicide. These findings may be helpful for clinicians in terms of identifying patients at higher risk of suicide, in order to ensure collaborative safety-planning [45], appropriately timed discharges to stable environments [18] and safe transitions from inpatient to outpatient care [33,47].

Strengths and limitations of the study

This study benefits from a large sample size, which includes all patients admitted to the psychiatric acute ward between 2005 and 2014, regardless of their ability to consent, thereby strengthening the representativeness of patients admitted to psychiatric acute wards. The longitudinal design further strengthens the study by allowing an analysis of the risk of suicide until 2023, based on data from the Norwegian death registry. This enabled the present study to investigate, more specifically, the association between the extent of frequency of admissions and the risk of suicide. In this study, only certain suicides were included in the analyses, which enhances the reliability and validity of the data. While this approach reduces the risk of misclassification, it can also lead to an underestimation of actual suicides and biased relations between the predictors and suicide. Nevertheless, the cohort contains a relatively high number of suicides (3.2% of the total cohort), e.g. compared to that of an extensive study from Spain by Mortier et al. [21], who reported 0.9% suicides from a total sample of 49,108. This may represent a strength in the statistical analysis of the present study.

However, this study has some limitations that need to be addressed. First, it is important to note that the last discharge in this study does not necessarily reflect the last actual discharge of the patients, as data collection ended in 2014. Second, precise data on the number of clinicians involved in conducting the clinical interviews and on interrater reliability were not available. Third, statistically significant findings are restricted mainly to the extremely high FA group, which comprises only 99 individuals of the total cohort. This limitation may restrict the clinical implications of the study to a small subgroup of patients admitted to psychiatric acute wards. Fourth, the categorisation of admission patterns relied partly on pragmatic thresholds, particularly for the upper groups. Although persistence was used to distinguish more persistent patterns of FAs from occasional episodes, alternative cut-offs

were not tested, which may affect comparability across studies. Alternative definitions and adjustments to the categorisations of the two upper FA groups might produce different risk estimates and should be explored in future research. Fifth, the results from this study only report associations between the frequency of admissions and the risk of suicide; they do not provide evidence of causality. Nevertheless, this study represents an important contribution to the research endeavour of identifying individuals at high risk of suicide among patients admitted to psychiatric acute wards.

Conclusions

This study shows that there is a threefold risk of suicide in patients with five or more admissions on average per utilisation year (extremely high FA group), compared to those without FAs. For the extremely high FA group, the risk of suicide is particularly elevated in the immediate time after the last discharge. This study contributes to the identification of a subgroup with a particular risk of suicide within a population of hospitalised psychiatric patients, namely the extremely high FA group. Potential prevention efforts should be directed at patients in this subgroup.

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Author contributions

All authors met all four ICMJE criteria for authorship. All authors contributed to the study conception, formulation of the research question, and study design. A.A.B., M.S. and R.G. analysed the data, and the interpretation of results was discussed with all authors. A.A.B. and M.S. drafted the manuscript, and A-S.F., M.T.S., R.G., and M.F.S. revised it critically. All authors approved the final version for publication.

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ORCID

Ane Askeland Buer http://orcid.org/0009-0002-1093-0917
Maria Fagerbakke Strømme http://orcid.org/0000-0002-5756-1584
Marit Schmid http://orcid.org/0000-0001-6582-1182
Anne-Siri Fismen http://orcid.org/0000-0001-6711-5767
Rolf Gjestad http://orcid.org/0000-0003-4578-6927
Mette Senneseth http://orcid.org/0000-0002-0668-6598

Data availability statement

The data that support the findings of this study are available from the corresponding author [A.A.B.], upon reasonable request. The data are not publicly available due to privacy or ethical restrictions.

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