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Factors contributing to readmission in patients with psychotic disorders, with a special reference to first follow-up visit in outpatient care

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Statements

Data Availability

The data that support the findings of this study are available from the Finnish Institute for Health and Welfare. Restrictions apply to the availability of these data, which were used under licence for this study. Data can be requested from the Finnish Social and Health Data Permit Authority Findata <https://findata.fi/en/>

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Conflict of interest disclosure

We declare no competing interests.

Ethics approval statement

The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008. The quality registry project received permission to use the registry data from the Finnish Institute for Health and Welfare. Because the data is based on national registers only, a separate ethical review or informed consent is not required in Finland.

Abstract

Introduction: Timely outpatient follow-up and readmission after discharge are common quality indicators in psychiatric care, but their association varies in previous research. We aimed to examine whether the impact of outpatient follow-up and other factors on readmission risk evolves over time in people with non-affective psychotic disorder (NAP).

Methods: The Finnish Quality of Care Register includes all people diagnosed with NAP since January 2010. Here, we followed patients with a hospital discharge between 2017 and 2021 until readmission, death, or up to 365 days. Time of the first outpatient follow-up appointment, length of stay (LOS), number of previous hospitalisations, psychosis diagnosis, substance use disorder (SUD), residential status, economic activity, gender, age, year and region were included. Follow-up time was divided into five periods: week 1, weeks 2–4, weeks 5–13, weeks 14–25 and weeks 26–52, and each period was analysed separately with Cox regression.

Results: Of the 29 858 discharged individuals, 54.1% had an outpatient follow-up within a week. A total of 10 623 (35.6%) individuals were readmitted. Short LOS increased the readmission risk in the first four weeks, whereas lack of outpatient follow-up raised the risk (adjusted HRs between 1.15 (95% CI: 1.04-1.26) and 1.53 (1.37-1.71) in weeks 5–52. The number of previous hospitalisations remained a consistent risk factor throughout the follow-up, while SUD increased risk after 4 weeks and living without family after 13 weeks.

Conclusions: Risk factors of readmission vary over time. These temporal patterns must be considered when developing outpatient treatment programs.

Keywords

Psychotic disorders/schizophrenia, Outpatient Treatment, Inpatient Treatment, Mental health services, Clinical outcomes measures

Introduction

Hospital readmissions and timely outpatient follow-up after discharge are commonly used benchmarks for assessing the quality of psychiatric care (Hermann et al., 2006; Byrne, Hooke, & Page, 2010; Katschnig et al., 2019; Durbin, Lin, Layne, & Teed, 2007; "National Committee on Quality Assurance: HEDIS Measures and Technical Resources," 2021), especially for schizophrenia and other psychotic disorders (Patel et al., 2022). Extensive research has examined readmissions, identifying several risk and protective factors, albeit with occasionally conflicting evidence (Donisi, Tedeschi, Wahlbeck, Haaramo, & Amaddeo, 2016; Edgcomb, Sorter, Lorberg, & Zima, 2020; Owusu, Oluwasina, Nkire, Lawal, & Agyapong, 2022; Sfetcu et al., 2017).

While the number of prior hospitalisations consistently predicts subsequent ones, the influence of factors like the length of hospital stay has varied (Donisi et al., 2016). Previous studies, covering various periods of follow-up and readmission intervals, have reported inconsistent results concerning the relationship between timely outpatient follow-up and readmissions (Beadles et al., 2015; Edgcomb et al., 2020; Hermer, Nephew, & Southwell, 2022; Katschnig, Straßmayr, Endel, Posch, & Steiner, n.d.; Kurdyak et al., 2018; Lee et al., 2015; Marcus, Chuang, Ng-Mak, & Olfson, 2017; Sfetcu et al., 2017). Indeed, factors linked to psychiatric readmissions may vary across different time segments following discharge, though there is currently a scarcity of comprehensive evidence in this area (Del Favero, Montemagni, Villari, & Rocca, 2020; Lee et al., 2015; Lin et al., 2010). In addition to timing, the type of the service may alter the association of follow-up and readmission. Previous studies have evaluated single or multiple contacts, different mean or content of contacts, primary or secondary care contacts or continuity of care, with mixed results (Sfetcu et al., 2017). For example, in a Japanese study, a consultation by a psychiatrist for at least 5 minutes was defined as follow-up and was beneficial, and in an Australian study, having a discharge plan sent to the patient's GP was beneficial (Callaly, Trauer, Hyland, Coombs, & Berk, 2011; Okumura, Sugiyama, & Noda, 2018).

In Finland, national healthcare registers have comprehensive coverage and relatively good quality with all public services in primary and secondary care and supported housing services maintained by social services (Sund, 2012). However, the exact content of a single outpatient contact cannot be determined from the registers and in some regions, mental health services may be integrated administratively to primary care and hence present in the primary care register. In addition, despite universal access to services in theory in Finland, long waiting times are a challenge for the system (Tynkkynen et al., 2018). For the purposes of this study, we focused on the first real-time contact to psychiatric services, supported housing services or primary healthcare as a measure reflecting the first step in continuation of care after discharge from psychiatric inpatient treatment. We hypothesized that the influence of different factors before and after discharge on the risk of readmission changes over time. By utilising Finnish healthcare registers, we examined the risk of readmission in individuals diagnosed with a non-affective psychotic disorder in a nationwide, representative patient cohort from the Finnish Quality of Psychosis Care Register.

Materials & methods

Data sources and study design

We used data from the Finnish Quality of Psychosis Care Register (FQPCR), which encompasses individuals diagnosed with a non-affective psychotic disorder. International Statistical Classification of Diseases and Related Health Problems (ICD-10) codes F20-F29 (schizophrenia, schizotypal and delusional disorders) or International Classification of Primary Care (ICPC-2) codes P72 (schizophrenia) or P98 (psychosis NOS) were included, and individuals were required to have any of these diagnoses at least once during the period 2010 to 2020. Excluded from both the FQPCR and

our study were individuals not residing in Finland, those under the age of seven, or those diagnosed with dementia prior to their initial psychosis diagnosis. The data for this study were drawn from the Care Register for Health Care, the Register of Primary Health Care visits, and the Register of Social Services, with population statistics from Statistics Finland linked to the data at an individual level.

We conducted a register-based cohort study including all individuals within the FQPCR who had been discharged from a psychiatric hospital (regardless of their current discharge diagnosis) between 1 January 2017 and 31 December 2021. Participants were followed from their first discharge during the study period until readmission, death, up to 365 days, or the end of the study period, which ever came first. Each individual's cohort entry was determined by the first discharge event. Discharges from forensic psychiatric hospitals were excluded.

The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008. The quality registry project received permission to use the registry data from the Finnish Institute for Health and Welfare. Because the data is based on national registers only, a separate ethical review or informed consent is not required in Finland.

Response variable

The primary focus of investigation was the determination of whether patients were readmitted to a psychiatric hospital within a window of 1 to 365 days following their discharge from the index hospitalisation.

Explanatory variables

The key explanatory variable was the time to the first outpatient follow-up contact after the index discharge during the follow-up period. Medical contacts with psychiatric outpatient clinics or primary care health centres, as well as with mental health housing units maintained by social services, were included. Both in-person and virtual real-time contacts were included.

Covariables were categorised as follows: Registered sex (man or woman), age group (7–12, 13–17, 18–29, 30–44, 45–64, 65–79, 80 years and over), calendar year, hospital district (20 administrative regions), length of stay (LOS) of the index hospitalisation (1–3, 4–13, 14–27, 28–83, 84 days and over), and number of previous hospitalisations (0, 1–4, 5–9, 10 and over). Discharge diagnoses of the index hospitalisations were categorised into eight groups: schizophrenia (ICD-10: F20), schizoaffective disorders (F25), delusional disorders (F22 and F24), acute and transient psychotic disorders (F23), schizotypal disorder (F21), other nonorganic psychotic disorders (F28), unspecified nonorganic psychosis (F29), and other diagnoses (if the current hospitalisation did not include a diagnosis from the ICD-10 group F20-29). The groups were mutually exclusive in the order presented above. The presence of substance use disorders (SUD, ICD-10: F10-F16, F18-F19) at the index discharge was recorded (present or not). In hospitals, only ICD-10 classification is used.

Data on residential status (living alone, with family or other, i.e. living in residential housing, institutions or homeless) and economic activity (employed, unemployed, under 15 years of age, student, retired, and others outside the labour force) were obtained from registers of Statistics Finland and represent the status on the last day of the year preceding the index discharge.

Analysis

Initially, linearity of the continuous covariables was assessed using penalized splines in Cox regression model and the covariables were categorised based on their associations and a prior knowledge on their nature. For example, according to Finnish law, individuals under 18 years of age must be treated in separate wards – those under 13 years in child and 13-17 years in adolescent

psychiatric wards, and LOS of four days is the maximum length of so-called observational period after an involuntary admission. Subsequently, the Chi-square test was employed to assess the differences among groups based on occurrences or readmissions. Using the Kaplan-Meier method, we performed rehospitalisation-free survival analysis based on the presence of outpatient follow-up and LOS of the index hospitalisation.

To delve into the risk factors associated with readmission, we employed a time-dependent Cox's proportional hazard model. Each subject's follow-up time was split into the period before and after the first outpatient follow-up contact. Proportional hazards assumption was assessed using Schoenfeld residuals and by visual assessment of the Kaplan-Meier curves. Notably, the proportional hazards assumption was found to be unsuitable for the outpatient follow-up variable for the entire follow-up time. Consequently, the one-year follow-up period was divided into distinct intervals: week 1, weeks 2–4, weeks 5–13, weeks 14–25 and weeks 26–52. Subgroup analyses were conducted for each of these periods, yielding hazard ratios (HRs) with corresponding 95% confidence intervals (CIs) for the comparison of not having an outpatient follow-up contact versus attending the first follow-up contact. The following adjustments were included in the analysis: basic adjustments including sex, age group, year and healthcare district; residential status, number of hospitalisations, diagnosis, presence of SUD, and economic activity. Bayesian information criteria were used for the model selection.

We conducted the following additional analyses: The sensitivity to definitions of the explanatory variable was investigated by alternative definitions: Secondary care, primary care and housing services were compared to no such follow-up (but possibly with other types of follow-ups), and the time interval for follow-up was restricted to the first 1, 4, 13 or 26 weeks (with later follow-up visits ignored). Finally, the main analysis was replicated using the Fine-Gray subdistribution hazard model with death as a competing event. Stata 17.1 (StataCorp LLC), and R 3.6.3 (R Project for Statistical Computing) were used for analyses and data management.

Results

Between 2017 and 2021, a total of 29 858 individuals (48.6% women, $n=14\ 521$) were discharged from psychiatric inpatient care, of whom 10 623 (35.6%) were readmitted and 495 (1.7%) died within the study period. Outpatient follow-up occurred within a week in 16 155 individuals (54.1%) and within four weeks in 22 817 (76.4%), while 4 563 individuals (15.3%) had no outpatient contact within the year following the index discharge. Descriptive statistics are presented in Table 1. The median age at discharge was 40 (interquartile range [IQR]: 28–58) years, while the median LOS of the index hospitalisation was 19 (IQR: 7–45) days. Roughly half of the population lived alone (50.9%, $n=15\ 185$), and nearly half were retired (49.8%, $n=14\ 863$). Non-affective psychotic disorder (ICD-10: F20–F29) discharge diagnosis was not present in 5 553 (18.6%) individuals, although these individuals had received such a diagnosis earlier. Of those without present diagnosis of non-affective psychosis, diagnoses of mood disorder (F30–F39) were present in 3 020 (10.1% of the whole sample), substance use disorder (F10–F19) in 1 603 (5.4%), anxiety disorders (F40–F48) in 1 209 (4.1%), personality disorders (F60–F69) in 823 (2.8%), organic mental disorders (F00–F09) in 394 (1.3%), disorders with onset usually occurring in childhood and adolescence (F90–F98) in 309 (1.0%) and other diagnoses in less than 1% of cases. Diagnosis of mania or bipolar disorder (F30–F31) was present in 1 352 (4.5%), and depression with psychotic features (F32.3 or F33.3) in 499 (1.7%) patients.

Association of outpatient follow-up and readmission

Kaplan-Meier analysis is shown in Fig 1. In the first two follow-up intervals including the first four weeks after the index discharge, the presence of outpatient follow-up visit did not exhibit a statistically significant association with readmissions. However, during the subsequent periods of 5-13, 14-25 and 26–52 weeks after the index discharge, the absence of outpatient follow-up visits was associated with increased hazard of readmission. The HR ranged from 1.24 (95% CI: 1.13-1.36) in weeks 5-13 to 1.58 (1.42-1.76) after basic adjustments and from 1.15 (1.04-1.26) to 1.53 (1.37-1.71) after all additional adjustments (Table 2).

Associations of other variables and readmission

Associations between other variables and readmission were observed. Notably, few variables exhibited consistent associations with readmission across all sub-periods; see Table 3. In models encompassing all additional adjustments, the number of previous hospitalisations consistently yielded heightened HRs and older age decreased HRs, while a diagnosis of delusional disorder was correlated with decreased HRs until 26 weeks. Other than delusional disorders, diagnostic categories had minimal impact across the sub-periods.

Furthermore, the relationships of several variables with the hazard of readmission varied over time. In the initial four weeks following the index discharge, LOS shorter than 28 days was associated with an increased likelihood of readmissions. However, after the first four weeks following the index discharge, this correlation with short LOS diminished. From the fifth week onwards after the index discharge, having a substance use disorder, and from the 13th week onwards, not living with family, exhibited associations with increased readmissions. Main type of activity did not show constant associations with readmissions.

Additional analysis

When follow-up only in secondary care, primary care or housing services were considered, the association between first follow-up and readmission reduced suggesting that the association is not specific for certain types of follow-ups. When the period of the first follow-up was restricted to the first 1, 4, 13, or 26 weeks after discharge, the observed HRs changed only a little. This suggests that the follow-up in outpatient care is associated with reduced readmissions, even if the first contact is later than in the first one or four weeks.

Discussion

In this population-based register study encompassing a nationally representative cohort of individuals with psychotic disorders, risk factors of readmission varied substantially over the first year after the index discharge. Shortly after discharge, only the number of previous hospitalisations and short hospital stays increased the risk of readmission. Lack of outpatient follow-up visits was associated with increased risk of readmission only after the first month following the index discharge. In addition, comorbid substance use disorders and social factors like living with family or being employed at the time of index admission associated with readmissions only later after the discharge. With time-varying analysis, this study provides new insight into the risk of readmission, and provides more detailed information on the importance of outpatient follow-up after discharge for clinical work and for interpretation on quality indicators of mental health services.

The current findings reveal a dynamic pattern in the risk factors associated with readmission among individuals with psychotic disorders. Specifically, our analysis demonstrates that a short LOS is linked to early readmissions, while the influence of a lack of outpatient follow-up is observable primarily after the initial month following discharge. This observed trajectory aligns with the premise that post-discharge symptom management is often tied to readmissions, and it is plausible that achieving

symptom control in psychotic disorders may not be feasible during very brief hospital stays (Sfetcu et al., 2017).

The present study contributes to previously limited literature on predictors of readmission at varying post-discharge time intervals. A study conducted in South Korea found that two or more outpatient visits within the first 60 days post-discharge in patients with schizophrenia reduced the risk of readmission in subsequent periods lasting 90 days or more. However, this study did not delve into early readmissions (Lee et al., 2015). Regarding LOS, a Taiwanese study demonstrated a risk reduction in readmissions within 14 days for LOS durations of 5–7 days, but not beyond this time frame in patients hospitalized with any mental disorder (Lin et al., 2010). Conversely, an Italian study reported an association between LOS and readmission after a six-month interval, but not within 30 days in patients hospitalized with any mental disorder (Del Favero et al., 2020). However, these two studies, which examined multiple time intervals, did not explore the role of post-discharge continuity of care as a contributing factor.

The findings of the present study contribute substantial evidence to affirming the advantages of outpatient follow-up in diminishing readmissions when the period is taken into account. Outpatient follow-up within 30 days has demonstrated a correlation with reduced readmissions in numerous, though not all, prior investigations (Sfetcu et al., 2017). For instance, a recent study in the United States found that patients with schizophrenia who received outpatient follow-up within 30 days of discharge exhibited no significant decrease in the likelihood of readmission compared to those who did not receive such care (Hermer et al., 2022). Notably, this study observed that only 10% of patients received outpatient follow-up within the 30-day period. Another study conducted in the US identified a marginal association between follow-up and readmissions (Beadles et al., 2015). The authors argued that establishing a universal seven-day threshold for the first outpatient follow-up might lack significance for all adults with diverse psychiatric conditions. In contrast to the estimates from the US, for example, in the current study, more than half of the patients received outpatient follow-up within a week, highlighting differences in healthcare system as another source of variation in the risk factors regarding readmissions.

The implications of LOS on the risk of readmission have also yielded inconclusive results in prior studies; these have reported that higher LOS either increases or decreases the risk of readmission (Donisi et al., 2016; Katschnig et al., n.d.). At the same time, the psychiatric bed numbers continue decreasing and LOS shortening (Mundt, Delhey Langerfeldt, Rozas Serri, Siebenförcher, & Priebe, 2021). Many recent investigations exploring outpatient follow-up have incorporated LOS as a covariable. For instance, in South Korea, LOS had no independent effect (Lee et al., 2015), while in the USA, the impact of LOS varied across state hospitals and other institutions, possibly modifying the relationship between outpatient follow-up and readmission (Hermer et al., 2022). A cross-country comparison within certain European countries revealed that LOS correlated with reduced psychiatric readmissions, wherein longer stays were associated with decreased risk in Finland and Norway, but conversely linked to increased risk in Romania (Katschnig et al., 2019). Taken together, the body of evidence suggests that in Finland, short LOS is associated with psychiatric readmission.

The present findings align with prior research regarding many of the variables under study. For instance, the consistent association between the number of previous hospitalisations and readmission risk is in line with previous literature (Donisi et al., 2016). Similarly, the observations that older age, being married, or being employed is linked to a reduced risk of readmission mirrors findings from earlier investigations (Donisi et al., 2016). Furthermore, consistent with earlier research, the impact of diagnosis was found to be small, although those with delusional disorders had a reduced risk and those with substance use disorders had an elevated risk of readmission

(Donisi et al., 2016). The current results indicate that the effects of these variables become evident primarily after the initial month following the index discharge, thereby suggesting that LOS and probably other clinical characteristics have an important role in shaping the risk of early readmission.

The variability of observed risk profiles in the readmission risks across studies suggest that contextual factors in the healthcare systems and psychiatric services may contribute substantially to the risk factors of readmissions. In Finland, readmission rates have demonstrated a rather average trend in European comparison (Katschnig et al., 2019). Subsequently, there has been an overall reduction in LOS, with 47% of all psychiatric hospitalisations lasting less than one week in 2021 (Kyrölä, Järvelin, & THL, 2022). Corresponding to global trends, the number of psychiatric beds has continued to decline in Finland in recent years, resulting in a count of 48 beds per 100,000 population by 2021 (Linnaranta, 2022). This evolution has spurred a spectrum of arguments both for and against such developments (Mundt et al., 2021). For instance, a Danish study contended that the diminished number of hospital beds leading to high bed occupancy rates may have compromised the quality and duration of acute inpatient care (Jeppesen, Christensen, & Vestergaard, 2016). Notably, in Finland, the increased emphasis on outpatient care has not resulted in subsequent reduction in the rates of first psychiatric hospital admissions, raising questions about the overall performance of the psychiatric health care system (Suokas et al., 2020).

Follow-up after discharge and continuity of care frequently emerge as significant indicators of the quality of psychiatric services. However, timely follow-up protocol may have beneficial outcomes other than reduced readmission, such as a reduction of symptoms and prevention of post-discharge suicides (Madsen, Egilsdottir, Damgaard, Erlangsen, & Nordentoft, 2021). In addition, it is possible that timely follow-ups may potentially result in an elevated number of readmissions, especially if LOS is brought down to a minimum or patients are discharged prematurely. Furthermore, established frameworks such as the Institute of Medicine's conceptualisation of quality of care encompass six dimensions: safety, timeliness, effectiveness, efficiency, equity, and patient-centredness (Institute of Medicine (US) Committee on Quality of Health Care in America, 2001). Within this framework, it becomes apparent that appropriate follow-up after discharge has value of its own regarding the spectrum of quality of care attributes.

Limitations

The present study has some limitations. Owing to the reliance on administrative data sources, there was no detailed clinical information available. Notably, there was no data pertaining to the nature of readmissions, such as whether they were planned or unplanned. Furthermore, the scope of follow-up was defined in broad terms as any contact with healthcare services, without specific information on the nature or content of these interactions. The original motivation for booking any medical appointments cannot be determined from the administrative registers in detail. Here we consider that the first real-time follow-up contact in psychiatric services, primary care or housing services serves as a proxy for continuation of care. In any case, however, follow-up contacts offer means for healthcare personnel to evaluate the patient's clinical situation and react accordingly. Furthermore, the actual content or intensity of the psychiatric outpatient care at and after the first contact is outside the scope of this study and would be better accounted with data sources other than administrative register alone.

The evaluation was based on a single discharge per individual, thus excluding the assessment of multiple events or the so-called revolving door phenomenon, which could potentially impact the interpretation of the findings. In addition, no data was available on severity of illness or attitudes towards treatment.

Conclusions

The quality of psychiatric hospital care remains a continuous concern. This study underscores the potential benefits of outpatient follow-up after discharge for individuals with psychotic disorders, although these advantages only become evident after a certain period. On the other hand, the link between a short hospital stay and the need for another hospital admission after a short period seems strong, at least in the Finnish context, suggesting the role of the adequacy of hospital care in the risk of readmission. This finding emphasizes the significance of evaluating quality indicators holistically, taking into account the intricate complexities and contextual factors that shape mental health services.

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Tables

Table 1. Description of study and sample characteristics

	Population			p-value ^a
	Overall N = 29 858	With readmission N = 10 623	Without readmission N = 19 235	
Time to the first follow-up, days				<0.001
1–7	16 155 (54.1)	5 411 (50.9)	10 744 (55.9)	
8–28	6 662 (22.3)	1 909 (18.0)	4 753 (24.7)	
29–91	1 800 (6.0)	455 (4.3)	1 345 (7.0)	
92–182	426 (1.4)	74 (0.7)	352 (1.8)	
183–365	252 (0.8)	18 (0.2)	234 (1.2)	
No within 365 days	4 563 (15.3)	2 756 (25.9)	1 807 (9.4)	
The first follow-up in secondary care	13 341 (44.7)	4 190 (39.4)	9 151 (47.6)	<0.001
The first follow-up in primary care	11 568 (38.7)	3 556 (33.5)	8 012 (41.7)	<0.001
The first follow-up in housing services	386 (1.3)	121 (1.1)	265 (1.4)	0.090
Sex: women	14 521 (48.6)	5 094 (48.0)	9 427 (49.0)	0.082
Age-group, years				<0.001
0–12	165 (0.6)	80 (0.8)	85 (0.4)	
13–17	1 082 (3.6)	518 (4.9)	564 (2.9)	
18–29	7 486 (25.1)	3 101 (29.2)	4 385 (22.8)	
30–44	8 087 (27.1)	2 925 (27.5)	5 162 (26.8)	
45–64	8 116 (27.2)	2 681 (25.2)	5 435 (28.3)	
65–79	4 077 (13.7)	1 168 (11.0)	2 909 (15.1)	
80 and over	845 (2.8)	150 (1.4)	695 (3.6)	
Discharge year				<0.001
2017	9 641 (32.3)	4 262 (40.1)	5 379 (28.0)	
2018	6 612 (22.1)	2 278 (21.4)	4 334 (22.5)	
2019	5 221 (17.5)	1 740 (16.4)	3 481 (18.1)	
2020	4 639 (15.5)	1 491 (14.0)	3 148 (16.4)	
2021	3 745 (12.5)	852 (8.0)	2 893 (15.0)	
Length of stay, days				<0.001
0–3	3 858 (12.9)	1 574 (14.8)	2 284 (11.9)	
4–13	8 212 (27.5)	3 229 (30.4)	4 983 (25.9)	
14–27	5 913 (19.8)	2 021 (19.0)	3 892 (20.2)	
28–83	8 633 (28.9)	2 749 (25.9)	5 884 (30.6)	
84 and over	3 242 (10.9)	1 050 (9.9)	2 192 (11.4)	
Previous hospitalisations, N				<0.001
0	9 908 (33.2)	2 584 (24.3)	7 324 (38.1)	
1–4	11 607 (38.9)	3 948 (37.2)	7 659 (39.8)	
5–9	4 398 (14.7)	1 864 (17.5)	2 534 (13.2)	
10 and over	3 945 (13.2)	2 227 (21.0)	1 718 (8.9)	
Diagnosis				<0.001
Schizophrenia	8 312 (27.8)	3 088 (29.1)	5 224 (27.2)	

	Population			p-value ^a
	Overall N = 29 858	With readmission N = 10 623	Without readmission N = 19 235	
Schizotypal disorder	236 (0.8)	80 (0.8)	156 (0.8)	
Delusional disorders	2 351 (7.9)	530 (5.0)	1 821 (9.5)	
Acute and transient psychotic disorders	1 819 (6.1)	501 (4.7)	1 318 (6.9)	
Schizoaffective disorders	2 908 (9.7)	1 206 (11.4)	1 702 (8.8)	
Other nonorganic psychotic disorders	222 (0.7)	84 (0.8)	138 (0.7)	
Unspecified nonorganic psychosis	8 457 (28.3)	2 763 (26.0)	5 694 (29.6)	
Others	5 553 (18.6)	2 371 (22.3)	3 182 (16.5)	
Mode of housing				<0.001
Alone	15 185 (50.9)	5 411 (50.9)	9 774 (50.8)	
With family	11 442 (38.3)	3 803 (35.8)	7 639 (39.7)	
Other	3 231 (10.8)	1 409 (13.3)	1 822 (9.5)	
Substance-use disorder	4 345 (14.6)	1 926 (18.1)	2 419 (12.6)	<0.001
Main type of activity				<0.001
Employed	4 516 (15.1)	1 242 (11.7)	3 274 (17.0)	
Unemployed	4 171 (14.0)	1 453 (13.7)	2 718 (14.1)	
Under 15 years	445 (1.5)	220 (2.1)	225 (1.2)	
Student	3 273 (11.0)	1 346 (12.7)	1 927 (10.0)	
Retired	14 863 (49.8)	5 401 (50.8)	9 462 (49.2)	
Others outside labour force	2 590 (8.7)	961 (9.0)	1 629 (8.5)	

^aChi-square test to assess the differences among those with and without readmissions.

Table 2. The unadjusted and adjusted risk of psychiatric readmission at different time intervals after discharge, among those without compared to those with follow-up in outpatient care after discharge

	Hazard Ratio (95% CI) ^a				
	Week 1	Weeks 2–4	Weeks 5–13	Weeks 14–25	Weeks 26–52
Crude	1.02 (0.89-1.17)	1.05 (0.95-1.16)	1.24 (1.13-1.36)	1.45 (1.29-1.62)	1.58 (1.42-1.76)
Basic adjustments ^b	1.01 (0.87-1.16)	1.06 (0.96-1.17)	1.23 (1.12-1.36)	1.44 (1.28-1.61)	1.61 (1.45-1.79)
Basic adjustments and mode of housing	0.99 (0.86-1.14)	1.04 (0.94-1.15)	1.19 (1.08-1.31)	1.39 (1.24-1.56)	1.58 (1.42-1.76)
Basic adjustments, mode of housing, and number of hospitalizations	1.01 (0.88-1.17)	1.02 (0.92-1.13)	1.16 (1.05-1.28)	1.37 (1.22-1.54)	1.57 (1.41-1.75)
Basic adjustments, mode of housing, number of hospitalizations, diagnosis, SUD ^c , and main type of activity	1.02 (0.89-1.17)	1.02 (0.92-1.13)	1.15 (1.04-1.26)	1.34 (1.20-1.50)	1.53 (1.37-1.71)

^aEstimates with p<0.05 are shown in bold.

^bBasic adjustments included sex, age group, year, and healthcare district.

^cSUD: substance use disorder

Table 3. The adjusted risk of psychiatric readmission at different time intervals after discharge by covariables^a

	Hazard Ratio (95% CI) ^b				
	Week 1	Weeks 2–4	Weeks 5–13	Weeks 14–25	Weeks 26–52
Sex					
Men	1 Ref.	1 Ref.	1 Ref.	1 Ref.	1 Ref.
Women	1.09 (0.96–1.23)	1.13 (1.03–1.25)	1.02 (0.94–1.11)	1.10 (1.01–1.21)	0.97 (0.90–1.05)
Age-group, years					
0–12	1.11 (0.43–2.87)	0.77 (0.46–1.29)	1.27 (0.76–2.11)	0.91 (0.48–1.71)	0.79 (0.38–1.64)
13–17	1 Ref.	1 Ref.	1 Ref.	1 Ref.	1 Ref.
18–29	1.03 (0.74–1.44)	0.86 (0.66–1.12)	0.76 (0.61–0.96)	0.85 (0.65–1.11)	0.68 (0.54–0.86)
30–44	0.86 (0.60–1.22)	0.65 (0.49–0.87)	0.61 (0.48–0.77)	0.67 (0.50–0.89)	0.47 (0.37–0.60)
45–64	0.66 (0.46–0.96)	0.68 (0.50–0.91)	0.52 (0.40–0.66)	0.53 (0.40–0.72)	0.36 (0.28–0.46)
65–79	0.66 (0.44–0.99)	0.46 (0.33–0.64)	0.49 (0.38–0.64)	0.57 (0.42–0.78)	0.38 (0.29–0.50)
80 and over	0.98 (0.57–1.68)	0.31 (0.17–0.54)	0.37 (0.25–0.56)	0.54 (0.35–0.82)	0.16 (0.10–0.26)
Length of stay, days					
0–3	2.65 (2.19–3.21)	1.37 (1.17–1.60)	1.11 (0.97–1.26)	0.89 (0.77–1.03)	0.82 (0.72–0.94)
4–13	2.09 (1.76–2.48)	1.39 (1.22–1.58)	1.15 (1.04–1.28)	1.03 (0.92–1.15)	0.93 (0.84–1.03)
14–27	1.48 (1.22–1.80)	1.26 (1.09–1.45)	1.07 (0.96–1.20)	0.98 (0.87–1.11)	0.98 (0.87–1.09)
28–83	1 Ref.	1 Ref.	1 Ref.	1 Ref.	1 Ref.
84 and over	0.96 (0.73–1.25)	0.97 (0.81–1.17)	0.89 (0.77–1.02)	0.90 (0.78–1.05)	0.83 (0.73–0.96)
Previous hospitalisations, N					
0	1 Ref.	1 Ref.	1 Ref.	1 Ref.	1 Ref.
1–4	1.19 (1.02–1.39)	1.28 (1.13–1.45)	1.31 (1.18–1.46)	1.26 (1.12–1.42)	1.28 (1.15–1.42)
5–9	1.45 (1.19–1.77)	1.65 (1.41–1.94)	1.65 (1.44–1.89)	1.81 (1.57–2.10)	1.69 (1.47–1.93)
10 and over	1.77 (1.43–2.19)	1.95 (1.65–2.32)	2.51 (2.18–2.89)	2.84 (2.44–3.31)	2.68 (2.33–3.09)
Diagnosis					
Schizophrenia	1 Ref.	1 Ref.	1 Ref.	1 Ref.	1 Ref.
Schizotypal disorder	1.09 (0.60–2.01)	1.06 (0.63–1.78)	0.78 (0.49–1.25)	0.82 (0.49–1.37)	0.97 (0.63–1.50)

	Hazard Ratio (95% CI) ^b				
	Week 1	Weeks 2–4	Weeks 5–13	Weeks 14–25	Weeks 26–52
Delusional disorders	0.59 (0.41–0.83)	0.75 (0.58–0.98)	0.82 (0.68–1.00)	0.72 (0.58–0.89)	1.09 (0.91–1.30)
Acute and transient psychotic disorders	1.02 (0.76–1.37)	1.04 (0.82–1.32)	0.93 (0.76–1.14)	0.88 (0.69–1.11)	0.97 (0.79–1.19)
Schizoaffective disorders	1.18 (0.96–1.46)	1.12 (0.95–1.33)	1.04 (0.91–1.19)	1.00 (0.86–1.16)	1.10 (0.96–1.25)
Other nonorganic psychotic disorders	1.76 (1.02–3.05)	1.51 (0.95–2.38)	0.61 (0.34–1.09)	1.27 (0.80–2.01)	1.15 (0.72–1.82)
Unspecified nonorganic psychosis	1.16 (0.97–1.40)	1.16 (1.00–1.35)	0.97 (0.86–1.10)	1.06 (0.92–1.21)	1.07 (0.95–1.21)
Others	1.25 (1.04–1.49)	1.34 (1.16–1.55)	1.08 (0.96–1.21)	1.13 (0.99–1.29)	1.14 (1.01–1.29)
Substance-use disorder					
No	1 Ref.	1 Ref.	1 Ref.	1 Ref.	1 Ref.
Yes	0.85 (0.72–1.01)	1.08 (0.95–1.23)	1.14 (1.03–1.28)	1.20 (1.06–1.35)	1.19 (1.07–1.33)
Mode of housing					
With family	1 Ref.	1 Ref.	1 Ref.	1 Ref.	1 Ref.
Alone	0.96 (0.84–1.10)	1.01 (0.91–1.13)	1.07 (0.98–1.17)	1.12 (1.02–1.24)	1.19 (1.09–1.30)
Other	1.20 (0.99–1.44)	1.15 (0.98–1.34)	1.09 (0.96–1.25)	1.10 (0.95–1.27)	1.09 (0.96–1.25)
Main type of activity					
Employed	1 Ref.	1 Ref.	1 Ref.	1 Ref.	1 Ref.
Unemployed	1.12 (0.90–1.40)	1.12 (0.94–1.34)	1.17 (0.99–1.38)	1.18 (0.99–1.40)	1.20 (1.03–1.40)
Under 15 years	0.85 (0.43–1.71)	2.21 (1.47–3.33)	1.60 (1.05–2.44)	1.76 (1.09–2.84)	0.93 (0.56–1.53)
Student	1.14 (0.89–1.44)	1.14 (0.94–1.39)	1.36 (1.15–1.62)	1.28 (1.06–1.54)	1.17 (0.99–1.38)
Retired	1.14 (0.93–1.40)	1.07 (0.91–1.27)	1.34 (1.16–1.56)	1.28 (1.09–1.50)	1.31 (1.14–1.51)
Others outside labour force	1.16 (0.91–1.49)	0.98 (0.80–1.21)	1.25 (1.04–1.49)	1.21 (0.99–1.47)	1.26 (1.06–1.49)

^aThe model included all covariables: sex, age group, year, healthcare district, outpatient follow-up, residential status, number of hospitalisations, diagnosis, substance use disorders, and economic activity.

^bEstimates with $p < 0.05$ are shown in bold.

Table 4. The adjusted^a risk of psychiatric readmission at different time intervals after discharge, among those without compared to those with follow-up in outpatient care after discharge by different definitions for the explanatory variable and with competing risk regression model

	Hazard Ratio (95% CI) ^b				
	Week 1	Weeks 2–4	Weeks 5–13	Weeks 14–26	Weeks 27–52
Main model	1.02 (0.89–1.17)	1.02 (0.92–1.13)	1.15 (1.04–1.26)	1.34 (1.20–1.50)	1.53 (1.37–1.71)
First follow-up in ^c					
Secondary care	0.96 (0.81–1.15)	0.97 (0.88–1.07)	1.01 (0.93–1.10)	1.15 (1.05–1.26)	1.10 (1.01–1.20)
Primary care	1.05 (0.87–1.25)	1.06 (0.96–1.18)	1.08 (0.99–1.17)	1.02 (0.93–1.12)	1.09 (1.01–1.19)
Housing services	2.15 (0.69–6.72)	0.86 (0.56–1.32)	1.12 (0.80–1.57)	1.20 (0.84–1.71)	1.58 (1.10–2.27)
First follow-up visit included only in the first ^d					
1 week	1.02 (0.89–1.17)	1.01 (0.92–1.10)	0.96 (0.88–1.03)	1.06 (0.98–1.16)	1.10 (1.02–1.19)
4 weeks	1.02 (0.89–1.17)	1.02 (0.92–1.13)	1.19 (1.08–1.30)	1.18 (1.07–1.30)	1.22 (1.12–1.34)
13 weeks	1.02 (0.89–1.17)	1.02 (0.92–1.13)	1.15 (1.04–1.26)	1.38 (1.23–1.53)	1.34 (1.23–1.52)
26 weeks	1.02 (0.89–1.17)	1.02 (0.92–1.13)	1.14 (1.04–1.26)	1.34 (1.20–1.50)	1.49 (1.34–1.66)
Competing risk regression ^e	1.02 (0.89–1.17)	1.02 (0.92–1.13)	1.15 (1.04–1.26)	1.34 (1.20–1.51)	1.53 (1.37–1.71)

^aThe models included all covariables: sex, age group, year, healthcare district, outpatient follow-up, residential status, number of hospitalisations, diagnosis, substance use disorders, and economic activity.

^bEstimates with $p < 0.05$ are shown in bold.

^cOnly certain type of follow-up considered. For example, in the case of secondary care, those without secondary care follow-up (but possibly with primary or housing services) compared to those with secondary care follow-up.

^dThe interval from discharge to the first follow-up visit restricted to specific values. Later follow-up visits ignored.

^eThe Fine-Gray subdistribution hazard model with death as a competing event. The estimates provided are subhazard ratios and 95% CIs.

Figure caption

Fig 1. Kaplan-Meier curves for readmission. (a) For follow-up in outpatient care. (b) For length of preceding hospital stay