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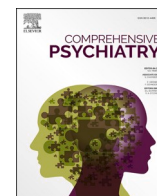


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Predictors for early and long-term readmission in involuntarily admitted patients

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ABSTRACT

Background: It is a common aim to reduce psychiatric readmissions. Although risk factors for readmissions were described, specific data in the group of patients with potentially aversively experienced involuntary admissions are lacking. To better understand underlying mechanisms, it is important to identify factors that are linked to readmissions in this specific patient group, which is the purpose of the current paper.

Methods: A four-year cohort of $N = 3575$ involuntary admissions (IA) was followed-up for subsequent re-hospitalization. Demographic, administrative and clinical factors associated with short- (within 30 days) or long-term (> 30 days) readmissions were examined using logistic regression modelling.

Results: Almost half of all IA cases were readmitted within the observation period, whereof every fifth readmission was within the first month after discharge from the involuntary index hospitalization. Adjusted regression modelling revealed problematic substance use at admission and assisted living or homelessness as risk factors for readmission, while high functioning at discharge, anxiety disorders, no subsequent treatment after discharge or IA due to danger to others were negatively associated with readmission. Factors specifically linked to short-term readmission were substance use and personality disorders, absence or discharge by initiation of the clinic, as well as being discharged to any place except the patient's home. There were no specific risk-factors for long-term readmission.

Conclusions: To prevent readmissions after IA, especially for patients at risk, the aim of treatment strategies should be to focus on intensive discharge planning, enable continuous treatment in the outpatient setting, and provide social support.

1. Background

During the last decades, the process of deinstitutionalization was driven by the idea to close or downsize psychiatric hospitals and to develop community-based mental health care models such as outpatient treatment and outreaching strategies. This process is based on political and economic considerations [1], as well as a recovery-centered approach to reduce multiple or long lasting psychiatric hospitalizations and provide treatment with a focus on the inclusion and integration of patients in their community [2]. Readmissions are associated with several drawbacks for patients and healthcare providers, including higher costs for both [3–5], a reduced quality of life for patients [6], distress for patients and their relatives, a worse course of illness as well

as a loss of social and working functioning for patients [7]. Hence, readmissions should be avoided whenever possible.

Irrespective of the recommendations to reduce inpatient treatment in general as well as the number and length of treatment episodes, the number of psychiatric beds is still high in some countries and Switzerland is among those with the highest number of psychiatric beds worldwide [8]. Although there are different outpatient treatment services [8], the inpatient units in Switzerland have occupancy rates of about 100% [9] and during the last years the number of psychiatric beds even increased slightly [10]. Besides those who need only one psychiatric admission in a crisis, some patients experience recurrent episodes with the need for repeated inpatient treatment. In general, between 7 and 50% of psychiatric inpatients are readmitted one or even more times

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for inpatient treatment during their lifetime, with a higher risk for readmissions during the first month after discharge [11,12]. Nevertheless, little is known about the patient-group of the so called “high utilizers” [13] or “heavy users” [4] which account for a “revolving door phenomenon” [14,15] due to their frequent use of inpatient treatment facilities, sometimes with short-term readmissions within a few weeks after discharge [4,15].

The existing body of research suggests that several factors regarding

the patients themselves are associated with a higher risk for readmission, such as substance use disorders, psychotic, manic and personality disorders, higher symptom severity, but also male gender, civil status, lower socioeconomic status, previous hospitalizations with short or extended treatment periods, and involuntary admissions (IA) [7,16–23]. Especially in patients with a history of IA, re-admissions must be weighted carefully because in association with the perceived coercion some tend to develop a negative picture of psychiatry [24]. This might

Table 1

Sociodemographic, clinical and administrative sample characteristics and distributive information on readmission time for the total study sample.

		Total sample distribution			Readmission subsample			
					Time to readmission			
		N(col%)	Median (IQR)	Mean ± SD	Median (IQR)	Mean ± SD	Corr.	p-value
Total		3575 (100.0)			48 (10;183)	136.2 ± 194.7		
Gender	Male	2037 (57.0)			49 (10;183)	134.2 ± 192.1		0.628
	Female	1538 (43.0)			48 (11;185)	138.9 ± 198.3		
Age			39.7 (29.7;51.3)	40.4 ± 12.5			0.033	0.175
Referring Person	GP	743 (20.8)			76 (15;214)	142.2 ± 179.2		0.406
Psychiatrist		719 (20.2)			38 (9;188)	145.6 ± 213.5		
Emergency physician		908 (25.5)			48 (10;182)	138.7 ± 202.6		
Somatic clinic		1095 (30.7)			48 (10;174)	127.3 ± 186.4		
Authorities, others		102 (2.9)			18 (6;107)	101.9 ± 174.1		
Coercion during treatment	No	2741 (76.7)			50 (11;188)	137.5 ± 194.9		0.627
	Yes	834 (23.3)			43 (8;171)	132.2 ± 194.2		
Duration until first coercive measure			2 (1;7)	6.8 ± 11.7			−0.007	0.886
Last coercive measure until discharge			11 (4;28)	19.7 ± 24.7			0.159	0.001
IA readmission	No	924 (55.5)			31(7;160)	124.1 ± 191.8		0.005
	Yes	741 (44.5)			72(19;204)	151.3 ± 197.2		
Clinical improvement	No	1429 (42.0)			29.5 (6;132)	109.6 ± 174.7		<0.001
	Yes	1977 (58.0)			77.5 (17;227)	161.3 ± 209.7		
GAF	Admission		31 (23;43)	33.5 ± 14.8			0.107	<0.001
	Discharge		55 (41;65)	53.5 ± 16.7			0.165	<0.001
	Delta		17 (6;31)	19.7 ± 18.7			0.083	0.001
Main diagnosis	Organic	107 (3.0)			18 (5;111)	77.3 ± 111.8		0.029
	Substance	819 (22.9)			45.5 (10;158)	124.5 ± 186.7		
	Psychotic	1367 (38.2)			65 (12;212)	152.0 ± 202.0		
	Depressive	410 (11.5)			38 (10;131)	120.0 ± 194.3		
	Neurotic	347 (9.7)			78 (17;214)	160.6 ± 218.2		
	Personality	234 (6.6)			31 (10;163)	117.0 ± 169.8		
	Others	93 (2.6)			15 (4;246)	123.4 ± 199.5		
	Manic	198 (5.5)			36.5 (8;203)	139.8 ± 212.0		
Psychiatric problems at admission								
Aggressive behavior			2 (1;3)	2.0 ± 1.5			0.003	0.890
	Self-harm		0 (0;2)	1.2 ± 1.7			−0.038	0.121
Substance abuse			2 (0;4)	2.2 ± 2.2			−0.053	0.032
Hallucinations/delusions			2 (0;3)	1.9 ± 2.1			0.036	0.145
Psychiatric problems at discharge								
Aggressive behavior			1 (0;2)	1.3 ± 1.3			−0.119	<0.001
	Self-harm		0 (0;1)	0.6 ± 1.3			−0.092	0.001
Substance abuse			1 (0;3)	1.5 ± 1.9			−0.117	<0.001
Hallucinations/delusions			1 (0;2)	1.3 ± 1.6			−0.018	0.517
Duration of hospitalization (days)			15 (6;34)	25.0 ± 28.9			0.061	0.013
Decision for Discharge discharge by agreement		2473 (71.3)			71 (16;218)	156.6 ± 207.8		
Initiative by clinic		198 (5.7)			21.5 (5;103)	77.8 ± 125.6		
Patients decision, against recommendation		363 (10.5)			50.5 (11;181)	124.9 ± 171.5		
	Abscondence	216 (6.2)			14 (5;61)	81.2 ± 171.5		
	Other	221 (6.4)			16 (4;103.5)	97.1 ± 156.5		<0.001
Treatment after discharge	No treatment	282 (8.1)			41 (7;136)	129.0 ± 196.7		
Outpatient psychiatrist/psychotherapist		2097 (60.4)			66 (16;214)	154.2 ± 205.0		
Other physician		346 (10.0)			17 (5;117)	103.6 ± 168.5		
Psychiatric clinic		205 (5.9)			32 (4;196)	121.4 ± 175.4		
	Other	541 (15.6)			31.5 (7;119)	105.1 ± 172.6		<0.001
Residency after discharge	Patients home	1997 (57.5)			69 (15;229)	157.6 ± 202.6		
	Assisted living	618 (17.8)			66 (14;192)	149.2 ± 214.9		
	Clinic	187 (5.4)			4 (1;17)	45.3 ± 131.4		
	Homeless	170 (4.9)			21 (6;159)	107.2 ± 177.2		
	Other	499 (14.4)			37 (10;131)	100.6 ± 152.3		<0.001
IA reason danger to oneself	No	1272 (36.0)			66.5 (13;259)	175.5 ± 239.8		
	Yes	2260 (64.0)			47 (10;154)	112.5 ± 153.0		<0.001
IA reason danger to others	No	2477 (70.1)			58 (12;210)	151.0 ± 210.0		
	Yes	1056 (29.9)			42 (8.5;144.5)	108.1 ± 152.8		<0.001

Note: GP = General practitioner; IA = Involuntary admission; GAF = Global Assessment of Functioning; Main diagnosis “others” includes ICD-10 F5, F7, F8 and F9; col. % = Column percent; IQR = Interquartile range; SD = Standard deviation; Corr. = Correlation; p-value = Overall p-value.

lead to refusal of readmission on a voluntary level in another crisis which increases their risk for additional coercion [25]. That is why the current paper focuses on this particular patient group.

Since only a part of the involuntarily admitted patients is readmitted it is not entirely clear which factors are associated with readmissions after IA and whether these factors might differ from risk factors for IA or readmission in general. Clinical risk factors for IA are organic, psychotic, manic, personality and substance use disorders, [26–32], suicidal behavior [26], danger to others [29,33,34], impulsive behavior [26,32] and poor insight into illness [34]. Also socio-demographic factors such

as higher age [32], male gender [28,33,35], but also female gender [31,34,36], not living in an own house [28,30,33] and being a foreign national [30,33,35], socio-economic deprivation [37] and living in urban settings [38] are associated with an increased risk for IA. Regarding procedural aspects, no intake of medication prior to admission [26], dissatisfaction with previous mental health care [39] and previous IA [32,39,40] have been described as risk factors for IA.

In clinical practice, it is difficult to predict which involuntarily admitted patients are at risk for readmission. Therefore, this study aimed to identify risk factors for readmission in a sample of involuntarily

Table 2

Sociodemographic, clinical and administrative sample characteristics and associations with readmission categories (no/short-/longterm readmission).

		Readmission categories			
		None	Shortterm	Longterm	
		N(row%)/Mean ± SD	N(row%)/Mean ± SD	N(row%)/Mean ± SD	p-value
Total		1910 (53.4)	706 (19.8)	959 (26.8)	
Gender	Male	1074 (52.7)	412 (20.2)	551 (27.1)	
	Female	836 (54.4)	294 (19.1)	408 (26.5)	0.585
Age		40.3 ± 12.9	40.3 ± 12.4	40.7 ± 11.8	0.764
Referring Person	GP	400 (53.8)	122 (16.4)	221 (29.7)	
	Psychiatrist	378 (52.6)	158 (22.0)	183 (25.5)	
	Emergency physician	469 (51.7)	185 (20.4)	254 (28.0)	
	Somatic clinic	613 (56.0)	204 (18.6)	278 (25.4)	
	Authorities, others	44 (43.1)	36 (35.3)	22 (21.6)	<0.001
Coercion during treatment	No	1493 (54.5)	527 (19.2)	721 (26.3)	
	Yes	417 (50.0)	179 (21.5)	238 (28.5)	0.074
Duration until first coercive measure		6.5 ± 10.1	6.5 ± 10.6	7.6 ± 14.8	0.443
Last coercive measure until discharge		22.4 ± 28.0	13.4 ± 20.0	19.7 ± 20.6	<0.001
IA readmission	No	–	461 (49.9)	463 (50.1)	
	Yes	–	245 (33.1)	496 (66.9)	<0.001
Clinical improvement	No	651 (45.6)	395 (27.6)	383 (26.8)	
	Yes	1135 (57.4)	293 (14.8)	549 (27.8)	<0.001
GAF	Admission	34.4 ± 15.7	31.2 ± 13.8	33.4 ± 13.5	<0.001
Discharge		55.9 ± 16.5	47.3 ± 16.6	53.4 ± 15.9	<0.001
Delta		21.2 ± 18.9	15.5 ± 17.5	19.9 ± 18.6	<0.001
Main diagnosis	Organic	48 (44.9)	34 (31.8)	25 (23.4)	
	Substance	389 (47.5)	194 (23.7)	236 (28.8)	
	Psychotic	686 (50.2)	252 (18.4)	429 (31.4)	
	Depressive	265 (64.6)	70 (17.1)	75 (18.3)	
	Neurotic	240 (69.2)	38 (11.0)	69 (19.9)	
	Personality	103 (44.0)	64 (27.4)	67 (28.6)	
	Others	67 (72.0)	16 (17.2)	10 (10.8)	
	Manic	112 (56.6)	38 (19.2)	48 (24.2)	<0.001
Psychiatric problems at admission	Aggressive behavior	1.9 ± 1.5	2.1 ± 1.5	2.0 ± 1.5	0.002
	Self-harm	1.2 ± 1.7	1.2 ± 1.6	1.0 ± 1.7	0.026
	Substance abuse	2.0 ± 2.2	2.5 ± 2.1	2.5 ± 2.2	<0.001
	Hallucinations/delusions	1.8 ± 2.1	1.9 ± 2.0	2.0 ± 2.0	0.037
Psychiatric problems at discharge	Aggressive behavior	1.2 ± 1.3	1.6 ± 1.4	1.2 ± 1.3	<0.001
	Self-harm	0.6 ± 1.2	0.9 ± 1.4	0.6 ± 1.3	<0.001
	Substance abuse	1.3 ± 1.8	1.9 ± 2.0	1.7 ± 1.9	<0.001
	Hallucinations/delusions	1.2 ± 1.6	1.5 ± 1.6	1.4 ± 1.6	0.005
Duration of hospitalization (days)		24.7 ± 29.9	22.9 ± 26.3	27.2 ± 28.5	0.009
Decision for Discharge	discharge by agreement	1371 (55.4)	396 (16.0)	706 (28.6)	
Initiative by clinic		74 (37.4)	72 (36.4)	52 (26.3)	
Patients decision, against recommendation		181 (49.9)	77 (21.2)	105 (28.9)	
Abscondence		74 (34.3)	94 (43.5)	48 (22.2)	
Other		121 (54.8)	57 (25.8)	43 (19.5)	<0.001
Treatment after discharge	No treatment	156 (55.3)	58 (20.6)	68 (24.1)	
Outpatient psychiatrist/psychotherapist		1105 (52.7)	361 (17.2)	631 (30.1)	
Other physician		177 (51.2)	98 (28.3)	71 (20.5)	
Psychiatric clinic		122 (59.5)	40 (19.5)	43 (21.0)	
Other		261 (48.2)	139 (25.7)	141 (26.1)	<0.001
Residency after discharge	Patients home	1154 (57.8)	302 (15.1)	541 (27.1)	
Assisted living		284 (46.0)	127 (20.6)	207 (33.5)	
Clinic		100 (53.5)	76 (40.6)	11 (5.9)	
Homeless		51 (30.0)	65 (38.2)	54 (31.8)	
Other		232 (46.5)	126 (25.3)	141 (28.3)	<0.001
IA reason danger to oneself	No	602 (47.3)	256 (20.1)	414 (32.6)	
	Yes	1297 (57.4)	423 (18.7)	540 (23.9)	<0.001
IA reason danger to others	No	1327 (53.6)	467 (18.9)	683 (27.6)	
	Yes	572 (54.2)	212 (20.1)	272 (25.8)	0.466

Note: GP = General practitioner; IA = Involuntary admission; GAF = Global Assessment of Functioning; Main diagnosis “others” includes ICD-10 F5, F7, F8 and F9; SD = Standard deviation; p-value = Overall p-value.

admitted patients with specific focus on the distinction between short- and long-term readmissions.

2. Material and methods

2.1. Sample

The study was performed at the Psychiatric University Hospital Zurich, which is Switzerland's largest psychiatric institution. It treats patients with all psychiatric diagnoses. Due to its public service obligation, it receives about a quarter of its patients with involuntary admission status [41].

The study included episodes of involuntarily admissions at the wards for adult treatment (320 beds) between January 1, 2017 to December 31, 2020. For the current study, cases with an age between 18 and 65 years were included. Within the four-year period, a total of $N = 2501$ patients were initially involuntarily admitted whereof almost a half ($n = 1227$; 49.1%) had more than one treatment episode during the observation period. The mean number of overall treatment episodes in our study sample was 1.4 (SD = 1.2), which leads to $N = 3575$ treatment episodes (cases) in total. All subsequent analyses and numbers reported in this study refer to case-wise counts only.

Of those, $n = 741$ (44.5%) were readmitted on an involuntary status. Those patients living outside the service area of our hospital were excluded to minimize biased results due to possible hospital changes after discharge from our hospital.

The sample consisted of more males ($n = 2037$, 57.0%) than females ($n = 1538$, 43.0%) and had a mean age of 40.4 years (SD = 12.5).

Further details on sociodemographic characteristics as well as on clinical variables are displayed in Tables 1 & 2 in the results section.

2.2. Measures

2.2.1. Involuntary admission

Article 426 of the Swiss Civil Code states that “a person suffering from a mental disorder or mental disability or serious neglect (...) may be committed to an appropriate institution if the required treatment or care cannot be provided otherwise” [42].

During any IA, the dignity rights of the person concerned must be preserved. Accordingly, it is required that IA may only be initiated after a person has been clinically examined. Also, the person and/or family members should be informed transparently about IA and their rights [42]. Transparency of the IA process is all the more important as there is a negative association between perceived coercion and feeling informed about IA [43]. Ethical guidelines emphasize that the exertion of coercion should always be the last option and critically reflected in treatment teams [44]. Nevertheless, compared to other countries, Switzerland has a high rate of IA [45]. There is a variance between the cantons (states) and Zurich is among those cantons with the highest rates of IA [46].

2.2.2. Readmission

Readmission was the main outcome variable. Time to readmission was measured in days, from the date of discharge from the index hospitalization to the subsequent readmission to our institution. We further recoded readmission time into a categorical variable to indicate 1.) no readmission within observation period, 2.) short-term readmission, i.e. readmission within 30 days after discharge, and 3.) long-term readmission, i.e. readmission at any time later than 30 days after discharge. No distinction was made between voluntary and involuntary readmission for modelling readmission time; however, this distinction was used for descriptive purposes.

2.2.3. Clinical routine data

We used data of the patients' routine documentation and quality assessment, which were rated by the responsible clinicians. Clinicians were obliged by the Swiss Department of Health to complete all

considered study measures at admission and discharge as part of the routine clinical care procedure. They were either senior psychiatrists, psychiatric residents or clinical psychologists. All relevant information was derived directly by standardized exploration interviews and behavioral observation, as well as indirectly by reports from nursing staff, social workers and significant others.

All raters were trained on clinical assessment as well as on the use and objectives of clinical measures, such as the Health of the Nation Outcome Scales (HoNOS [47]), the Global Assessment of Functioning (GAF [48]) for assessment of functional levels as well as the Clinical Global Impression (CGI [49]) scale as measure for clinical improvement.

2.2.3.1. Clinical aspects. Patients were diagnosed according to the International Classification of Diseases, 10th edition (ICD-10 [50]) criteria. For the purpose of the current study, the sample was divided into the following subgroups according to the patients' primary diagnosis, namely (1) mental disorders due to known physiological disorders (organic disorders); (2) substance use disorders (substance abuse); (3) schizophrenia and other psychotic disorders (psychotic episodes); (4) affective disorders; except manic episodes (depressive episodes); (5) manic episodes and bipolar disorders; except depressive or mixed episodes (manic episodes); (6) anxiety and somatoform disorders (neurotic disorders); (7) personality disorders (personality disorders); and (8) remaining diagnoses (others).

Clinical impairment was assessed at admission and discharge of index hospitalization using four selected HoNOS items, namely 1.) aggressiveness, 2.) non-accidental self-injury, 3.) problematic drinking or drug-taking, and 4.) hallucinations and delusions. The HoNOS is an observer-rated scale and originally consists of 12 items with a five-point Likert scale response format from 0 (no problems) to 4 (severe/very severe problems) [47]. Level of functioning was assessed using the GAF, which is a 100-point single-item observer-rated scale. It rates the overall functioning on a continuum from mental health (100) to mental illness (0) [48]. Significant clinical improvement was measured using the 7-point CGI subscale “Clinical improvement” that originally ranges from 1 “very much improved” to 7 “very much worse” [49], and was dichotomized for our purposes into “improvement” (very much improved/much improved) versus “no improvement” (minimally improved through very much worse).

Information on length of index stay as well as on the occurrence of coercive measures during treatment was obtained from the clinical routine documentation.

2.2.3.2. Demographic and administrative data. Besides data on age and gender, we included admission data on the referring persons' professional background as well as the reasons for IA. Furthermore, discharge information on the circumstances regarding the discharge, housing situation and treatment after discharge as well as the occurrence of and time until readmission (see above for more information) was used for the current analyses.

2.3. Statistical methods

For sample description, distributions of all variables, i.e. socio-demographic, clinical and administrative variables were provided for the study sample (Table 1). For those who were readmitted, distribution information of time to readmission (Mean \pm standard deviation; Median/IQR) after discharge from index hospitalization at any time during observation period were provided for the total sample as well as for each level of categorical predictors. Associations between continuous predictors and time to readmission were calculated by Pearson Product-Moment correlations. Kaplan-Meier curves were provided for categorical predictors in case of significant associations with time to readmission (Fig. 1a–h) for the subgroup of readmitted patients. For a better visualization of early readmissions (i.e. within 30 days) in the figures,

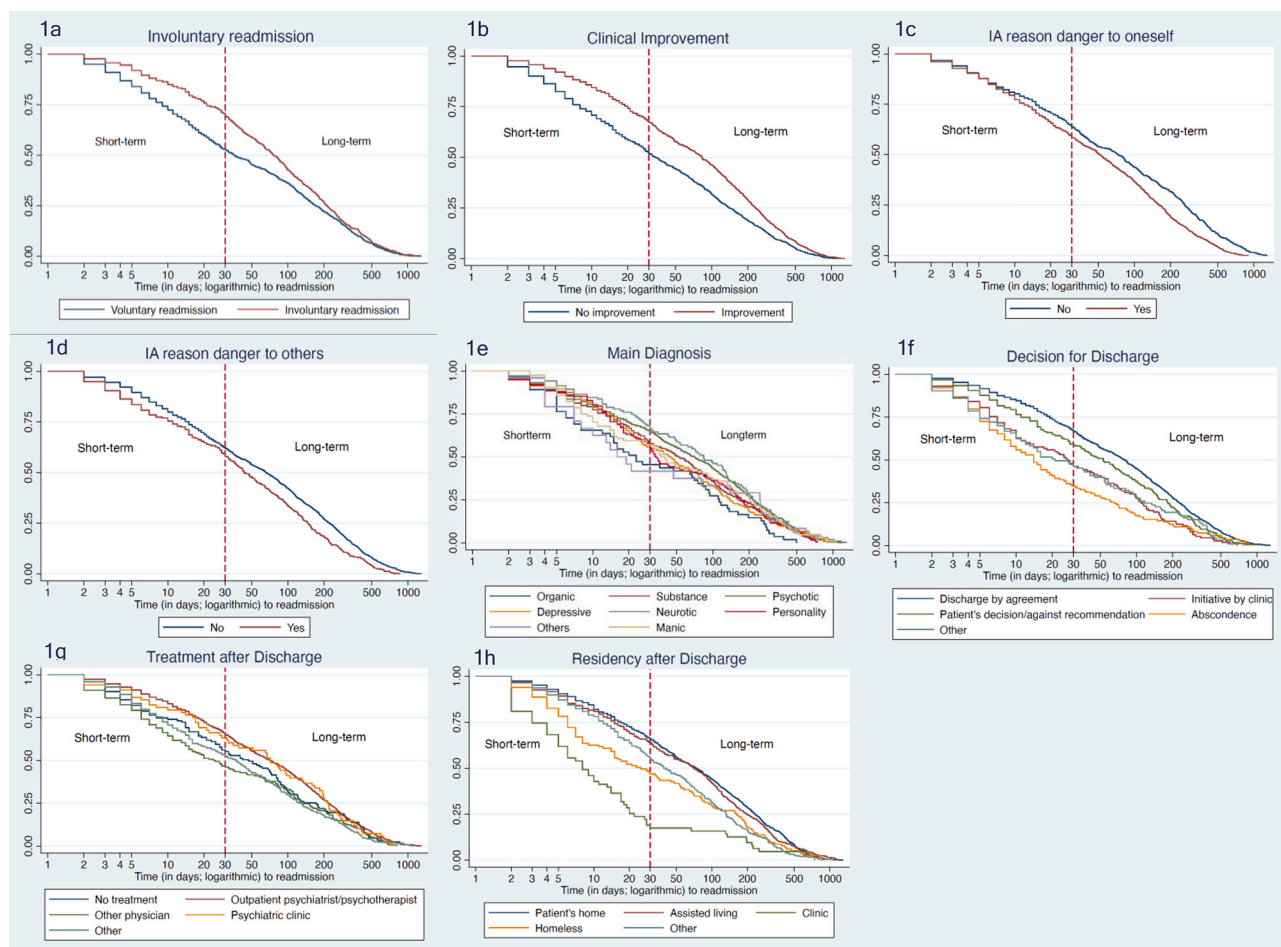


Fig. 1. Kaplan-Meier estimates for time to readmission in involuntary admitted patients.

readmission time was transformed into logarithmic values.

Associations with categories of readmission (No/short-term/long-term) were analyzed using Chi-square test for categorical variables and analyses of variance (Oneway-ANOVA) for continuous variables (Table 2). Furthermore, multinomial logistic regressions were calculated to estimate the likelihood of short- or long-term readmission by all predictor variables (Table 3). Odds ratios (OR) were calculated with 95% confidence interval (CI) with no readmission serving as the reference condition in all models. Since missing values were assumed to be completely at random pairwise deletion was implemented in all analyses.

To facilitate comparability of the effect sizes between the different scales, continuous predictor variable scores were z-standardized for their use in regression modelling. Categorical predictors with more than two categories were treated in a logical sense, i.e. the largest category was used as reference for estimating odds ratios.

Finally, a multivariate logistic model was fitted with previously selected predictor candidates from unadjusted models that showed significance of $p < .25$ [51] and with gender and age, which were always included as covariates. Significant predictor variables with $>10\%$ of missing data were also excluded from multivariate modelling, even when bi-variately linked to outcomes [52].

All analyses were conducted using STATA SEv16.

2.4. Ethics

The study was reviewed and approved by the Cantonal Ethics Commission of Zurich, Switzerland (Reference Number EK: Req-2019-02470). It was performed in accordance with the ethical standards

laid down in the 1964 Declaration of Helsinki and its later amendments. An identification of the patients was not possible at any time of the study.

3. Results

Overall, almost half of all cases (46.6%) were readmitted during the observation period. The mean readmission time was 136.2 days (SD = 194.7 days), whereof 50% of readmissions took place within seven weeks after discharge (see Tables 1 & 2). Every fifth readmission (19.8%) took place within one month after discharge (i.e. short-term readmission; see Table 1). More than half of all readmissions were voluntarily (see Table 1).

Table 1 also indicates that longer overall time to readmission was associated with a longer time between last coercion and discharge, involuntary readmission (Fig. 1a), clinical improvement (Fig. 1b), overall higher functioning, functional improvement, and longer treatment during the index hospitalization. Shorter readmission times were linked to observer-rated substance-abuse problems at admission or discharge, aggressive behavior or self-harm tendencies at discharge, as well as IA due to dangers to oneself (Fig. 1c) or others (Fig. 1d). Other variables that were associated to readmission time were primary diagnosis (Fig. 1e), decision for discharge (Fig. 1f), as well as treatment (Fig. 1g) and residence after discharge (Fig. 1h). For more details on associations of categorical variables with readmission time please refer to Table 1.

Almost all variables (i.e. except for gender, age, coercion during treatment, time between last coercive measure and discharge as well as IA due to danger to others) were associated either with short- or long-

Table 3

Bi- and multi-variate multinomial logistic regression models for the prediction of short- and longterm readmission (vs. no readmission) in a sample of involuntary admitted psychiatric inpatients.

		Shortterm	Longterm	Shortterm	Longterm
		vs. no readmission		vs. no readmission	
		crude OR (95%CI)	crude OR (95%CI)	adjusted OR (95%CI)	adjusted OR (95%CI)
Gender	Male	ref.	ref.	ref.	ref.
	Female	0.92 (0.77–1.09)	0.95 (0.81–1.11)	1.04 (0.85–1.28)	1.08 (0.90–1.28)
Age		1.00 (0.91–1.09)	1.03 (0.95–1.11)	0.99 (0.90–1.10)	1.05 (0.96–1.15)
Referring person	GP	0.77 (0.59–1.01)	1.02 (0.82–1.28)	0.74 (0.55–0.99)*	0.99 (0.78–1.26)
	Psychiatrist	1.06 (0.82–1.36)	0.89 (0.71–1.28)	1.12 (0.85–1.48)	0.91 (0.71–1.17)
	Emergency physician	ref.	ref.	ref.	ref.
	Somatic clinic	0.84 (0.67–1.06)	0.84 (0.68–1.03)	0.91 (0.70–1.19)	1.03 (0.81–1.30)
	Authorities, others	2.07 (1.29–3.33)**	0.92 (0.54–1.57)	1.61 (0.89–2.89)	0.98 (0.54–1.77)
Coercion during treatment	No	ref.	ref.	ref.	ref.
	Yes	1.22 (0.99–1.49)	1.18 (0.98–1.42)	1.10 (0.86–1.40)	1.01 (0.82–1.26)
Duration until first coercive measure ^a		1.00 (0.83–1.21)	1.10 (0.94–1.28)		
Last coercive measure until discharge ^a		0.61 (0.48–0.78)***	0.90 (0.77–1.05)		
Clinical improvement	No	ref.	ref.	ref.	ref.
	Yes	0.43 (0.36–0.51)***	0.82 (0.70–0.97)*	0.74 (0.59–0.94)*	0.84 (0.68–1.03)
GAF	Admission ^a	0.80 (0.72–0.87)***	0.93 (0.86–1.01)		
Discharge		0.59 (0.54–0.65)***	0.86 (0.79–0.93)***	0.73 (0.65–0.83)***	0.88 (0.80–0.98)*
Delta ^a		0.73 (0.66–0.80)***	0.93 (0.86–1.01)		
Main diagnosis	Organic	1.93 (1.21–3.06)**	0.83 (0.51–1.37)	1.50 (0.88–2.56)	0.91 (0.54–1.54)
	Substance	1.36 (1.08–1.70)**	0.97 (0.79–1.19)	1.56 (1.16–2.09)**	0.97 (0.75–1.26)
	Psychotic	ref.	ref.	ref.	ref.
	Depressive	0.72 (0.53–0.97)*	0.45 (0.34–0.60)***	1.04 (0.71–1.51)	0.54 (0.39–0.75)***
	Neurotic	0.43 (0.30–0.62)***	0.46 (0.34–0.62)***	0.56 (0.36–0.87)*	0.54 (0.39–0.77)**
	Personality	1.69 (1.20–2.39)**	1.04 (0.75–1.45)	1.94 (1.27–2.96)**	1.27 (0.86–1.88)
	Others ^b	0.65 (0.37–1.14)	0.24 (0.12–0.47)***	1.26 (0.64–2.49)	0.44 (0.21–0.95)*
	Manic	0.92 (0.62–1.37)	0.69 (0.48–0.98)*	1.29 (0.83–2.01)	0.83 (0.56–1.22)
Psychiatric problems at admission	Aggressive behavior	1.16 (1.06–1.26)**	1.09 (1.01–1.18)*	1.06 (0.94–1.18)	0.99 (0.89–1.09)
	Self-harm	0.99 (0.91–1.08)	0.90 (0.83–0.97)**	1.01 (0.91–1.13)	0.94 (0.85–1.03)
	Substance abuse	1.27 (1.17–1.39)***	1.24 (1.15–1.34)***	1.17 (1.04–1.30)**	1.21 (1.10–1.33)***
	Hallucinations/delusions	1.03 (0.94–1.12)	1.10 (1.02–1.19)*	0.92 (0.82–1.04)	0.99 (0.89–1.09)
Psychiatric problems at discharge	Aggressive behavior ^a	1.38 (1.25–1.53)***	1.06 (0.97–1.17)		
	Self-harm ^a	1.21 (1.10–1.32)***	1.01 (0.91–1.11)		
	Substance abuse ^a	1.37 (1.24–1.51)***	1.24 (1.13–1.36)***		
	Hallucinations/delusions ^a	1.16 (1.05–1.28)**	1.11 (1.01–1.21)*		
Duration of hospitalization (days)		0.93 (0.85–1.02)	1.08 (1.01–1.17)*	0.98 (0.88–1.10)	1.06 (0.97–1.15)
Decision for discharge	discharge by agreement	ref.	ref.	ref.	ref.
	Initiative by clinic	3.37 (2.39–4.75)***	1.36 (0.95–1.97)	1.66 (1.11–2.46)*	1.37 (0.91–2.05)
	Patients decision, against recommendation	1.47 (1.10–1.97)**	1.13 (0.87–1.46)	1.29 (0.93–1.78)	0.96 (0.72–1.28)
	Abstinence	4.40 (3.18–6.08)***	1.26 (0.87–1.83)	2.63 (1.75–3.93)***	0.84 (0.54–1.30)
	Other	1.63 (1.17–2.28)**	0.69 (0.48–0.99)*	0.93 (0.61–1.42)	0.56 (0.36–0.88)*
Treatment after discharge	No treatment	1.14 (0.82–1.57)	0.76 (0.56–1.03)	0.65 (0.44–0.95)*	0.66 (0.47–0.92)*
Outpatient psychiatrist/psychotherapist		ref.	ref.	ref.	ref.
	Other physician	1.69 (1.29–2.23)***	0.70 (0.52–0.94)*	0.95 (0.67–1.35)	0.74 (0.54–1.03)
	Psychiatric clinic	1.00 (0.69–1.46)	0.62 (0.43–0.89)**	0.52 (0.31–0.86)*	1.02 (0.67–1.54)
	Other	1.63 (1.29–2.07)***	0.95 (0.75–1.19)	0.80 (0.58–1.10)	0.76 (0.57–1.03)
Residency after discharge	Patients home	ref.	ref.	ref.	ref.
	Assisted living	1.71 (1.34–2.18)***	1.55 (1.27–1.91)***	1.73 (1.32–2.28)***	1.46 (1.16–1.84)**
	Clinic	2.90 (2.10–4.02)***	0.23 (0.12–0.44)***	2.38 (1.48–3.83)***	0.20 (0.10–0.41)***
	Homeless	4.87 (3.30–7.18)***	2.26 (1.52–3.36)***	2.71 (1.76–4.17)***	1.78 (1.16–2.73)**
	Other	2.08 (1.61–2.67)***	1.30 (1.03–1.64)*	1.68 (1.20–2.35)**	1.61 (1.19–2.18)**
IA reason danger to oneself	No	ref.	ref.	ref.	ref.
	Yes	0.77 (0.64–0.92)**	0.61 (0.52–0.71)***	0.74 (0.60–0.91)**	0.60 (0.51–0.72)***
IA reason danger to others	No	ref.	ref.	ref.	ref.
	Yes	1.05 (0.87–1.27)	0.92 (0.78–1.10)		

Note: N = 3.306 cases were subjected to multivariate analyses due to caseswise deleted missing; GP = General practitioner, GAF = Global Assessment of Functioning; IA = Involuntary admission; ^aVariables not included in multi-variate model due to missing data >10%; ^bMain diagnosis “others” includes ICD-10 F5, F7, F8 and F9; OR = Odds ratio; 95%CI = 95% confidence interval; ***p ≤ .001; **p ≤ .01; *p ≤ .05; Crude OR with p ≤ .25 (i.e. potential predictor candidates) were print in bold.

term readmission (see Table 2).

Conditional probability estimates for each predictor(–level) for the prediction of short- and long-term readmission (against no readmission) are given in Table 3.

Readmission in general (i.e. either short- or long-term readmission) was positively linked to higher HoNOS ratings at admission (such as aggressive behavior and substance abuse) and discharge (substance abuse and psychotic symptoms), as well as homelessness or assisted living after discharge. In contrast, factors that were negatively associated to readmission were clinical improvement, lower functioning at discharge, and unipolar depressive or anxiety disorders as primary

diagnosis as well as IA due to danger to others. Specifically, short-term readmissions were associated with referrals by authorities, primary diagnoses of organic mental, substance use or personality disorders, by observer-rated aggressive behavior or self-harm at discharge, by any discordant discharge, by non-psychiatric treatment, or admission into any (somatic) clinic after discharge. Further, we found that involuntary readmissions were initiated twice as likely after >30 days post-discharge compared to voluntary readmissions (OR = 2.02; 95%CI = 1.65–2.46; not tabulated).

After adjusting for all potential predictors, problematic substance use at admission, as well as assisted living and homelessness, remained as

promoting “general readmission” factors. On the other hand, several variables, such as high functioning at discharge, primary diagnosis of anxiety disorder, no subsequent treatment after discharge, or IA due to danger to others at the index-admission, were negatively linked to readmission in general.

Specific effects promoting short-term readmission only were found in the following instances: substance use or personality disorders, absence of the patient or discharge by initiative of the clinic, as well as a referral to another clinic. Referrals by a GP, clinical improvement during treatment as well as subsequent psychiatric inpatient treatment after discharge were, in contrast, associated with a lower likelihood for short-term readmissions. Having a primary diagnosis of any depressive disorder and a referral to another clinic specifically decreased the risk for long-term readmission.

4. Discussion

Our study showed that almost a half of the involuntarily admitted patients experienced readmission(s) within the four-year observation period, wherefrom every second case was readmitted on an involuntary basis again. We further found that about 20% of the involuntarily admitted patients were readmitted within 30 days after discharge. This implicates that voluntary and involuntary readmissions are frequent in initially involuntarily admitted patients.

4.1. Clinical predictors for readmissions after involuntary admission

Patients with substance use and personality disorders were at higher risk for short-term as compared to more delayed readmissions after IA. Since those disorders often follow a chronic course with fast fluctuations in symptomatology this result was rather expected. Patients with personality disorders typically have difficulties in interpersonal relationships. Borderline personality disorder, the most frequently diagnosed personality disorder in the inpatient setting [53], was associated with frequent readmissions, specifically in cases of self-harming behavior in previous studies [54]. Interestingly and contrary to this finding, self-harming behavior prior to the index IA was a negative predictor for readmissions in our study. Also, self-harm or harm to others at admission were not significantly associated with readmissions. Although suicidal behavior [26] or danger to others [29,33,34] are known risk factors for IA, the predictive value seems less conclusive for readmissions after IA.

On a symptom-level we found that high ratings of substance abuse in the HoNOS were positive predictors for readmissions. Despite high motivation levels, patients with substance use disorders often need multiple attempts to reach a long-term abstinence. Those with drop-outs of therapy have a higher risk for readmissions for a new attempt or after intoxication which requires intensive monitoring [55]. More flexible outpatient treatment approaches might be helpful to reduce multiple inpatient treatment episodes, which can have detrimental effects if they are based on an involuntary admission [56].

Our study sample of involuntarily admitted patients consisted of predominantly psychotic cases, wherefrom about half of the sample was readmitted within the observation period. It is known that schizophrenia can have a chronic course in about one third of patients. In contrast to those cases, other diagnoses such as anxiety and depressive disorders were found to be at lower risk for readmissions. An overrepresentation of patients with schizophrenia in involuntary and readmitted patients is in accordance with previous studies [56], possibly due to an under-supply of outpatient interventions. In fact, compared to the treatment of depression, specific outpatient interventions for patients with schizophrenia are scarce, although interventions such as “open dialogue” are associated with less inpatient treatment episodes in this patient group [57].

Irrespective of the diagnosis, interventions based on a continuation of care-model [58] and transitional interventions such as pre- and post-discharge patient psychoeducation, structured needs assessments,

medication reconciliation/education, transition managers and in-patient/out-patient provider communication [59] were found to prevent readmissions. Also, medication adherence and compliance with follow-up appointments were protective factors for readmissions and should be promoted, especially in those patients at risk for readmissions [20]. Further, psychiatric advance directives were found to reduce the risk of involuntary readmissions since the patient can state which measure(s) to use during a crisis [60].

In our study, a favorable clinical course, i.e. clinical improvement during treatment or higher functioning, decreased the risk for readmissions, especially for an early readmission within 30 days after discharge. Conversely, this supports the concept of severe mental illness (SMI) [19] along with an increased risk for the revolving door phenomenon.

4.2. Non-clinical predictors for readmissions after involuntary admission

Patients with involuntary admissions and referrals by a GP were at lower risk for short-term readmissions than others. As shown in previous studies, IA from physicians without routine in the handling of psychiatric emergency situations were shorter [61]. Compared to psychiatrists, non-psychiatric physicians felt less secure in the decision-making process on IA [62]. GPs are not regularly involved in psychiatric treatment and might have less knowledge on outpatient treatment options which can result in a faster referral to a psychiatric hospital although alternatives would have been sufficient [31,32]. On this background, patients' organizations and other stakeholders demand that the competence to decide on IA should be restricted to specialized and well educated groups of physicians [56].

IA can lead to a disturbed therapeutic relationship [63]. This might result in reluctance and in some cases absence with a discontinuation of treatment and the necessity for a readmission which explains the increased risk for short term readmissions after absence.

Interestingly, besides absence, non-clinical predictors such as assisted living and homelessness also increased the likelihood for short- and long-term readmissions substantially. The strong associations of these categories point out the complexity of psychiatric treatment which does not only cover medical and therapeutic interventions but, especially in patients with SMI, also has to focus on the psychosocial situation of the patient. Psychological wellbeing needs a solid ground with financial perspectives and secure housing. It was shown that programs to reduce homelessness, such as housing programs or case management can reduce readmission rates. Therefore it is recommended that the search for alternatives to homelessness should be integrated in the treatment plans of homeless psychiatric patients to avoid readmissions [64]. Otherwise, affected patients are at risk for chronification of their illness - and consecutively - homelessness. Besides that, despite of the efforts needed for their initiation, housing programs were shown to reduce total costs induced by these patients [65] and in addition, they promote the autonomy of the persons. In patients who are in need of assisted living, easy accessible intensive outpatient psychiatric care might help to avoid escalating situations in which inpatient crisis intervention is demanded by the nursing staff or the patients themselves.

In contrast, also those who were discharged by the clinic's decision against their will had higher odds to be readmitted within a month. Such discharges can be initiated due to non-participation in the therapies, lack of treatment goals, or if the patient seems to use psychiatric institutions for other aspects, such as a safe space, a place to make relationships or to avoid homelessness. Alternatives with other approaches and support might be better suitable for this group. Again, for those who issue IA, a good knowledge on such alternatives is required to avoid unnecessary IA.

Discharge to another clinic (except psychiatric clinics) was a strong and specific predictor for early readmission, while long-term readmissions were highly unlikely under this condition. Somatic medical issues, which cannot be sufficiently monitored and treated in the

psychiatric hospital, often need early discharges to a somatic clinic and result in frequent transfers, which are troublesome for the patients. An active consultation service might be helpful to reduce transfers to other clinical facilities to a minimum. In contrast, a transfer to another psychiatric clinic is mostly based on the background that a specific treatment is needed which is not provided in the initial clinic.

4.3. Limitations and strengths

The data used in this study stems from one Swiss clinic only. Therefore, readmissions to other hospitals could not be detected, leading to a possible underestimation of readmissions. Nevertheless, the mental healthcare structure in the canton of Zurich stipulates that its psychiatric hospitals cover the treatment of persons living in specific areas. Therefore, inpatient treatment outside of the associated hospital is seldom, since the respective psychiatric hospital is the only one in the area with said service obligation. Therefore, almost all IAs in the area are (initially) admitted to the clinic. To minimize possible bias due to hospital change we excluded patients living outside the service-area of our hospital.

Our results are based on case-wise analyses. Therefore, patients with frequent IA during the study period might be overrepresented regarding diagnoses and socioeconomic data. The long observation period of four years, the service obligation, and the broad treatment range of the study site might compensate this bias in parts.

Furthermore, the four-year period of the study leads to an imbalance of cases near to the cut-off points which might have had previous admissions or readmissions only shortly before or after the study period. Similarly, we could not account for dropouts resulting from death or emigration out of the canton since those records are not publicly available.

This study is based on retrospective analyses of clinical routine data and quality assessment parameters. Therefore, the study design does not allow to draw conclusions on causalities of the risk factors but rather implies statistical associations only.

Besides these limitations, some strengths of this study are the large number of included cases, the broad spectrum of clinical, procedural and sociodemographic variables, and the long duration of the analyzed period. The data can also be considered representative because of the clinic's service obligation for an area of 1.5 million people. Furthermore, to our knowledge, this is the first study evaluating risk factors in a particular group of involuntarily admitted patients.

5. Conclusion

In recovery centered approaches outpatient treatment (such as outpatient individual therapy, group therapy, day clinics) and out-reaching strategies (such as visits by nurses, home treatment) are recommended to enable an inclusion in the patients' environment (including meaningful living, work, social, relationships) whereas inpatient treatment is discussed to rip patients out of their "real life" [66,67]. To avoid a vicious circle of readmissions after IA, especially in patients with SMI and psychosocial troubles, it is important to provide strategies which fit to the risk factors and enable a continuous treatment in the outpatient setting. This might help to reduce aversive readmissions in this specific patient group with IA which is at risk for a disturbed therapeutic relationship [63] and aversive feelings towards psychiatric care [24].

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Declaration of Competing Interest

All authors declare none.

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