



Factors associated with repetitive violent behavior of psychiatric inpatients

Didier Camus^{a,*}, Elise S. Dan Glauser^b, Mehdi Gholamrezaee^c, Jacques Gasser^b,
Valerie Moulin^b

^a Department of Psychiatry, Site de Cery, 1008 Prilly, Lausanne University Hospital (CHUV), Lausanne, Switzerland

^b Unit for Research in legal Psychiatry and Psychology, Institute of Forensic Psychiatry, Department of psychiatry, Lausanne University Hospital (CHUV), Site de Cery, Bat. Les Cèdres, 1008 Prilly, Lausanne, Switzerland

^c Center for Psychiatric Epidemiology and Psychopathology, Department of Psychiatry, Site de Cery, 1008 Prilly, Lausanne University Hospital (CHUV), Lausanne, Switzerland

ARTICLE INFO

Keywords:

Repetitively violent patients
Psychiatric inpatients
Violent behavior
Institutional
Situational and individual factors

ABSTRACT

A small number of psychiatric inpatients displays a large proportion of Violent Behaviors (VB). These can have a major impact on both victims and patients themselves. This study explored personal, situational and institutional risk factors and their combined effects, which could lead to repetitive VB (three or more assaults). Data from 4518 patients, aged 18 to 65, admitted to an acute psychiatric care facility, were included in the analysis. VB, defined as physical aggressions against another person, were assessed by the Staff Observation Aggression Scale-Revised. 414 VB were reported during the study period, involving 199 patients. 0.75 % of all patients were repetitively violent and committed 43% of all VB. Factors that were linked to repetitive VB were living in sheltered housing before hospitalization, suffering from schizophrenia with substance abuse comorbidity, cumulating hospitalization days and some situational factors, like the fact of being in nursing offices and pharmacies. When all personal, situational and institutional factors were considered together, the combined effects of length of stay and living in sheltered housing increased the risk of repetitive VB. We have identified a small group of vulnerable patients for whom new modalities of inter-institutional networking should be developed to prevent repetitive VB.

1. Introduction

It has long been recognized that a small number of psychiatric inpatients are responsible for a large proportion of physical Violent Behaviors (VB) against others (Barlow et al., 2000; Grassi et al., 2006; Grenyer et al., 2013; Lussier et al., 2010; Owen et al., 1998). Some patients commit violence in a repetitive manner, which complicates the treatment for themselves and for the other patients (Convit et al., 1990; Lussier et al., 2010). Moreover, these repetitive violence are more likely to inflict serious injury (Convit et al., 1990) or significant psychological distress (Wildgoose et al., 2003) and lead to staff dissatisfaction, absenteeism, or incapacity to work (Abderhalden et al., 2007; Arnetz and Arnetz, 2001; Barlow et al., 2000; Baxter et al., 1992; Flannery, 2002; Gadon et al., 2006; Needham et al., 2005; Owen et al., 1998; Rippon, 2000). These patients are referred to in different studies as “chronically violent patients” or “repetitively violent patients” (RVPs) (Broderick et al., 2015; Convit et al., 1990; Flannery, 2002; Lussier et al.,

2010; Owen et al., 1998).

If there is an extensive literature on psychiatric inpatient violence, few studies have rigorously characterized RVPs (Barlow et al., 2000; Blow et al., 1999; Broderick et al., 2015; Convit et al., 1990; Flannery and Walker, 2008; Flannery, 2002; Grassi et al., 2006; Grenyer et al., 2013; Kraus and Sheitman, 2004; Lussier et al., 2010; Owen et al., 1998). In addition, while the literature has shown that violence in psychiatric hospital is linked to individual factors, few studies have also examined situational and contextual factors and their combined effects, which could also lead to repetitive violence (Dack et al., 2013; Flannery, 2002; Gadon et al., 2006; Shepherd Mélanie, 1999;).

Regarding individual factors, it was suggested that RVPs tend to be younger than non-violent patients (NVPs), without an age limit to be specified (Flannery, 2002), as well as to have an history of violence (Owen et al., 1998) or substance abuse (Dack et al., 2013; Krakowski et al., 1989). If some previous studies have failed to establish a link between patient gender and likelihood of being a RVP (Flannery, 2002;

* Corresponding author at: Nursing Department, Department of Psychiatry, Site de Cery, 1008 Prilly, Lausanne University Hospital (CHUV), Lausanne, Switzerland.
E-mail addresses: Didier.Camus@chuv.ch (D. Camus), Mehdi.Gholam@chuv.ch (M. Gholamrezaee), Jacques.Gasser@chuv.ch (J. Gasser), Valerie.Moulin@chuv.ch (V. Moulin).

Lussier et al., 2010), two recent meta-analyses found that being a woman (Dack et al., 2013) or being a woman suffering from schizophrenia (Flannery et al., 2014) increase the likelihood of repetitive VB. Regarding diagnosis, there is a lack of consensus. While a meta-analysis of Dack et al. (Dack et al., 2013) does not confirm that diagnoses differentiate patients, some studies have shown that patients who suffer from schizophrenia (Decaire et al., 2006; Flannery et al., 2014; Lussier et al., 2010; Steinert, 2002), personality disorders (Lussier et al., 2010), or a neurological impairment (Owen et al., 1998), are more likely to be RVPs.

Empirical data related to institutional and situational risk factors for repetitive VB are rather scarce and inconclusive (Dack et al., 2013; Flannery, 2002). Nevertheless, regarding institutional factors, i.e., the characteristics and conditions of the hospitalization, a longer length of stay was one of the most consistent predictors (Cornaggia et al., 2011). In addition, the proportion of RVPs seems higher among patients with repeated psychiatric hospitalizations or who have been involuntarily admitted to hospital (Owen et al., 1998). Regarding situational factors, i.e., the environmental conditions in which the aggression occurs, no studies to our knowledge has targeted RVPs. Studies on VPs can give some indications but have produced inconsistent results. For example, assaults seem to occur more often during daytime (Welsh et al., 2013). They were found more frequent in the morning (Flannery, 2007; Vandamme, 2009) but more intense in the afternoon (Vandamme, 2009). Other studies have however reported peaks in violence either at the beginning of the afternoon or at the end of the day (Carmel and Hunter, 1989; Chou et al., 2002), during shift changes, consecutive to patient-staff interactions (Groleau and Da Silva Guerreiro, 2019), during meal times (Flannery, 2007), or during the administration of medication (Gadon et al., 2006). In addition, the risk of assaults is higher in areas of high level of social interaction (communal areas, corridors, dining room) (Gadon et al., 2006). Other factors capable of triggering VB include constraints, such as denying a patient something, seclusion, forced medication, or restrictions of movements within the unit (Barlow et al., 2000; Gadon et al., 2006).

Various authors point to the need for further studies on this topic (Iozzino et al., 2015; Lussier et al., 2010), taking into account the limits and confounding factors mentioned in previous works. Notably, there is the need to give a clear definition of violence (Bowers et al., 2011; Flannery et al., 2014; Rund, 2018; Sanghani et al., 2017) and of RVPs (Lussier et al., 2010), to add situational and institutional factors (Flannery, 2002), and to control for the diversity of data sources (e.g., nurse's notes, administrative data, or systematic questionnaires (Lussier et al., 2010)).

In the present study, we have considered violence as any violent physical contact directed against another person (Convit et al., 1990; Tardiff and Sweillam, 1982), whether or not it was associated with other types of violence (such as verbal violence, or violence against objects). In line with other studies (Convit et al., 1990; Owen et al., 1998; Quanbeck et al., 2007), we categorized as RVPs only those patients who produced three or more VB in the same hospital stay.

The objective of the present study is twofold: 1/ to examine independently the links between patient characteristics (socio-demographic and main diagnosis) and repetitive VB, the links between institutional variables (length of stay, number of admissions, type of admission) and repetitive VB, and the links between situational factors (such as location, time and provocation factors) and repetitive VB, 2/ to explore the combined association of factors that are linked to repetitive VB. We have hypothesized that it is the combined association of factors that are involved in repetitive VB compared to non-repetitive VB.

2. Methods

2.1. Study site and participants

This study was carried out during a 4-year period (2009-2012) in the

psychiatry department of the Lausanne University Hospital (Switzerland), on the 15 wards (219 beds) that are specialized in acute psychiatric care for adults. All patients admitted to these wards during the study period were considered which represent 4518 patients, aged between 18 and 65 years. Lausanne University's Faculty of Biology and Medicine Research and Ethics Committee granted access to clinical data for research purposes.

2.2. Categorization of patients in three groups

We divided our sample in three groups. The first one regrouped patients who never committed VB (*Non-Violent Patients*, NVP). The second group included patients who committed no more than one or two VB during the same hospital stay over the 4-year study period (*Non-Repetitive Violent Patients*, NRVP), and the third group included those who committed three or more VB in the same hospital stay over the 4-year study period (*Repetitive Violent Patients*, RVP).

Of the total unique patients (N=4518), 2549 had multiple hospital admissions. For these patients, the following methodology was used to determine the particular hospital stay included in the analysis: a) for patients who displayed no violent acts, the most recent hospital stay was used; b) for patients with number of VB occurrence below the threshold for repetitive violence during any stay, the first stay in which violent behavior occurred was used; and c) for patients who displayed violent acts meeting or exceeding the threshold for repetitive violence during any stay, the first stay in which the patient exceeded the repetitive violence threshold was used.

Situational factors in relationship to repetitive violence were considered over all the VB episodes that occurred over the study period (N=414).

2.3. Measures

2.3.1. Episodes of violent behaviour

Episodes of VB occurring during the treatment phase were identified on the basis of the Staff Observation Aggression Scale-Revised (SOAS-R scale (Nijman et al., 1999)), a structured assessment tool that lists all events related to a violent incident during hospitalisations. The SOAS-R can be used to rate the nature of aggressive incidents (e.g., verbal aggression, physical aggression against another person or physical aggression against self (Moulin et al., 2017)) and the target of the aggression. As indicated in the previous definition, we only took into account physical violence. The scale was completed by staff members after each violent incident.

2.3.2. Personal factors

Socio demographic and diagnosis data were taken from the hospital's database. For each patient and for each studied hospital stay, we considered:

- Some **socio-demographic variables**, which were the patients' age and gender, as well as the marital and living status at the beginning of the considered stay.
- The diagnosis assessment**, which was the main psychiatric diagnosis determined by a psychiatrist and the staff according to the ICD-10 (International Statistical Classification of Diseases and Related Health Problems)(Organization, 2004) criteria. We subdivided diagnoses into six categories: substance use disorders, schizophrenia, mood disorders, personality disorders, cognitive disorders, and other disorders. We controlled and adjusted the model for co-morbidity of substance use disorders in schizophrenia and in personality disorders and for co-morbidity of personality disorders in schizophrenia, which are known to be risk factors for VB (Bjørkly, 2013; Flannery et al., 2014; Moulin et al., 2018; Moulin et al., 2017).

Table 1
Individual characteristics and institutional factors by group

Individual Characteristics		Total (4518)	NVPs (4319)	NRVPs (165)	RVPs (34)
Age	Years [median(range)]	40.24 (18 – 64.99)	40.44 (18 – 64.98)	35.74 (18.06 – 64.99)	38.63 (19.09 – 64.36)
Gender	Women [% (n)]	49.23 (2224)	49.73 (2148)	36.97 (61)	44.12 (15)
	Men [% (n)]	50.77 (2294)	50.27 (2171)	63.03 (104)	55.88 (19)
Marital status	Not married [% (n)]	75.14 (3395)	74.58 (3221)	86.67 (143)	91.18 (31)
	Married [% (n)]	23.84 (1077)	24.4 (1054)	12.12 (20)	8.82 (3)
	Missing [% (n)]	1.02 (46)	1.02 (44)	1.21 (2)	0 (0)
Living status	Sheltered housing [% (n)]	10.72 (446)	10.07 (401)	19.18 (28)	58.62 (17)
	Alone [% (n)]	31.98 (1330)	32.03 (1276)	32.19 (47)	24.14 (7)
	Other [% (n)]*	57.3 (2383)	57.91 (2307)	48.63 (71)	17.24 (5)
Diagnosis	Substance use disorders [% (n)]	25.46 (1094)	25.56 (1052)	23.84 (36)	20 (6)
	Schizophrenia [% (n)]	23.37 (1004)	22.47 (925)	42.38 (64)	50 (15)
	Mood disorders [% (n)]	26.69 (1147)	27.19 (1119)	16.56 (25)	10 (3)
	Personality disorders [% (n)]	10.17 (435)	10.15 (416)	10.6 (16)	10 (3)
	Cognitive disorders [% (n)]	1.68 (72)	1.58 (65)	3.97 (6)	3.33 (1)
	Other disorders** [% (n)]	13.17 (566)	13.61 (560)	2.65 (4)	6.67 (2)
	Comorbid disorders	Schizophrenia and substance use disorders [% (n)]	3.83 (173)	3.45 (149)	10.3 (17)
	Schizophrenia and personality disorders [% (n)]	1.02 (46)	0.97 (42)	1.82 (3)	2.94 (1)
	Personality disorders and substance use disorders [% (n)]	2.43 (110)	2.36 (102)	3.64 (6)	5.88 (2)
Institutional Factors					
Admission type	Voluntary [% (n)]	62.32 (2814)	63.81 (2756)	30.30 (50)	23.52(8)
	Involuntary [% (n)]	37.78 (1704)	36.26 (1563)	69.7 (115)	76.47 (26)
Previous length of stay	Days [median(range)]	0 (0 – 1206)	0 (0 – 1206)	44 (0 – 727)	185 (3 – 1085)
Previous number of hospitalizations	Number [median(range)]	0 (0 – 45)	0 (0 – 45)	1 (0 – 18)	1 (0 – 37)

*: Living as a couple with or without children, or living with family

** : Anxiety, adaptation, dissociative, somatoform, or eating disorders, as well as mental retardation.

2.3.3. Institutional factors

Institutional factors were taken from the hospital's database and include:

- The **type of admission** for the considered hospital stays (voluntary or involuntary).
- The **previous length of stay**, which cumulatively counted the days until VB for VPs. For NRVPs, this was from the first day of the first stay within the 4-year period of the study until the first occurrence of 1 or 2 aggressions in the same stay. For RVPs, this count went from the first day of the first stay until the stay where at least 3 aggressions in the same stay were recorded. For NVPs, the length of stay was cumulated from the first day of the first stay until the last day of the last stay in the study period.
- The **number of previous hospital stays**, counting for each patient all the stays before the considered hospitalization stay.

2.3.4. Situational factors

VB were recorded using the Staff Observation Aggression Scale-Revised (SOAS-R) (Nijman et al., 1999). The SOAS-R covers information such as “provoking factors”, “means used by the patient”, “the target of the aggression”, “the consequences for the target”, and “the measures taken to resolve the aggression”. The scale was completed by staff members after each violent incident. We assessed the context in which VB occurred by extracting from the SOAS-R the data on a) the type of violence, b) the target of the aggression, c) the location of the incident, d) the time of the incident, and e) the trigger of the VB. 2.4. Statistical analyses

To address our objectives and our hypotheses, the analysis strategy consisted of analyzing, for the first objective: the independent links between individual factors and repetitive versus non-repetitive VB, the independent links between situational factors and repetitive versus non-repetitive VB, and finally the independent links between institutional factors and repetitive versus non-repetitive VB. We therefore conducted separate logistic regressions on the groups of variables. Since there could be more than one violent incident per hospital stay, and since situational factors may vary for each incident, it was impractical to integrate

situational, individual and institutional factors in the same model. Thus, and in order to follow the second objective, we performed in a first step a regression analysis that included institutional and individual factors. In a second step, and to analyze the combined association of individual, situational and institutional factors and the link with repetitive versus non-repetitive VB, we performed a series of logistic regression models for each situational factor in each group (NRVPs vs. RVPs), adjusted for both individual and institutional factors. A Classification and Regression Tree (CART) was also employed to explore potentially non-linear and hierarchical impact of institutional and individual factors and their association on the group of RVP. These models were fitted using the *glm* package in R (Lee et al., 2006). For categorical variables, comparisons were made between each category and a reference category which is specified in the corresponding tables. In these models, we had to exclude co-morbidity of substance abuse in personality disorders because of their small number.

We considered all the VB occurrences (N=414) during all hospital stays to identify the association between each situational factor and the group (RVP vs NRVP). Since patients could commit more than one VB over the 4-year period, we used Generalized Linear Mixed Effect Models (GLMMs), with a common random intercept for observations corresponding to the same patients. These models were fitted using penalized quasi likelihood (McCullagh and Nelder, 1989; Schall, 1991). As there were missing values in some variables, each model was fitted using 100 multiple imputations via chained equations, implemented within the “mice” package in R (Buuren and Groothuis-Oudshoorn, 2010). These models were adjusted on violent patients only, and describe the association between the characteristics of each incident in relationship with the patient committing the violence (belonging to the RVP or the NRVP group).

We used Classification and Regression Trees (CARTs) (Breiman et al., 1984). CARTs are capable of discerning hierarchical associations among a group of explanatory variables and a response variable (Breiman et al., 1984). We used this analysis to investigate the hierarchical effects attributable to combinations of factors (individual and institutional) on repetitive VBs, assuming that the effect of each factor could be intensified or moderated by the presence of the others.

Table 2
Violent act and situational factors by group

Type of violence and target		Total VPs (414)	NRVPs (234)	RVPs (180)
Type of violence	Physical violence [% (n)]	38.41 (159)	39.74 (93)	36.67 (66)
	Physical and verbal violence [% (n)]	48.31 (200)	47.01 (110)	50 (90)
	Physical assault associated with verbal violence and violence against objects [% (n)]	8.94 (37)	8.97 (21)	8.89 (16)
	Physical assault associated with violence against objects [% (n)]	4.35 (18)	4.27 (10)	4.44 (8)
Target of the aggression	Staff member [% (n)]	81.16 (336)	76.5 (179)	87.22 (157)
	Other patient [% (n)]	21.01 (87)	24.36 (57)	16.67 (30)
	Other person [% (n)]*	7.25 (30)	8.97 (21)	5 (9)
Situational Factors Time of the incident	Total VPs (414)	NRVPs (234)	RVPs (180)	
	Morning (7h-12h) [% (n)]	22.95 (95)	20.51 (48)	26.11 (47)
	Afternoon (12h-18h) [% (n)]	37.92 (157)	36.32 (85)	40 (72)
	Evening (18h-22h) [% (n)]	24.4 (101)	25.64 (60)	22.78 (41)
	Night (22h-7h) [% (n)]	14.73 (61)	17.52 (41)	11.11 (20)
Location of the incident	Patient's room [% (n)]	11.59 (48)	10.68 (25)	12.78 (23)
	Seclusion room [% (n)]	22.46 (93)	23.5 (55)	21.11 (38)
	Healthcare facility [% (n)]	9.9 (41)	6.41 (15)	14.44 (26)
	Communal areas [% (n)]	40.34 (167)	43.16 (101)	36.67 (66)
	Other places [% (n)] **	15.7 (65)	16.24 (38)	15 (27)
Trigger of the aggression	Not understandable provocation [% (n)]	20.53 (85)	18.8 (44)	22.75 (41)
	Other patient(s) [% (n)]	9.9 (41)	13.68 (32)	5 (9)
	Patient being denied something [% (n)]	23.91 (99)	22.65 (53)	25.56 (46)
	Help with activities of daily living [% (n)]	5.31 (22)	3.42 (8)	7.78 (14)
	Staff requiring patient to take medication [% (n)]	10.39 (43)	8.97 (21)	12.22 (22)
	Other provocation [% (n)]***	37.44 (155)	40.17 (94)	33.89 (61)

*: Family and relatives, security staff, or other professionals.
 **: WC, bathroom, external area, etc.
 ***: For example acute symptoms, acute intoxication and reminders from staff about hospital rules.

All statistical analyses were performed using R environment for statistical computing (Team, 2019).

3. Results

3.1. Descriptive characteristics of the sample

During the 4-year study period, 4518 patients were admitted to hospital and 414 VB were recorded. The sample contained almost equal numbers of men and women, who had a median age of 40 years. Most were not married (75.1%). The most frequent diagnoses were mood disorders (26.69 %), substance use disorders (24.46%) and schizophrenia (23.37%). Most patients were admitted voluntarily (62.32%). Over the study period, the median of previous length of stay was 0 days (range 0-1206) and the median of previous hospitalizations was 0 (range

Table 3
Logistic regression models

Individual Factors (Model 1)		Odds ratio	Lower CI 95%	Upper CI 95%	p
Age		1.00	0.96	1.05	.959
Gender (Reference = Male)		2.29	0.83	6.59	.114
Marital Status (Reference = Married)		0.51	0.15	1.64	.261
Living status (Reference = Alone)	Sheltered housing	5.45	1.85	18.06	.003
	Others	0.38	0.09	1.4	.151
Diagnosis (Reference = Mood disorders)	Schizophrenia	1.85	0.4	10.92	.456
	Cognitive disorders	0.94	0.03	14.51	.967
	Substance use disorders	3.21	0.62	20.72	.183
	Personality disorders	0.79	0.08	6.32	.822
	Other disorders	7.04	0.64	73.81	.095
Comorbid disorders (Reference = Others)	Schizophrenia and substance use disorders	4.31	1.01	19.82	.051
	Schizophrenia and personality disorders	2.85	0.12	31.98	.425
Institutional Factors (Model 2)		Odds ratio	Lower CI 95%	Upper CI 95%	p
Admission type (Reference = Voluntary admission)		2.85	0.75	12.92	.144
Previous length of stay		1.19	1.07	1.34	.002
Previous number of hospitalizations		0.92	0.81	1.02	.140
Individual and Institutional Factors (Model 3)		Odds ratio	Lower CI 95%	Upper CI 95%	p
Age		0.99	0.94	1.04	.742
Gender (Reference = Male)		2.58	0.84	8.46	.103
Marital Status (Reference = Married)		0.62	0.17	2.24	.460
Living status (Reference = Alone)	Sheltered housing	2.76	0.75	10.61	.128
	Others	0.28	0.06	1.09	.072
Diagnosis (Reference = Mood disorders)	Schizophrenia	1.48	0.24	11.62	.683
	Cognitive disorders	0.89	0.03	14.29	.940
	Substance use disorders	3.39	0.52	28.71	.223
	Personality disorders	0.52	0.04	5.57	.594
	Other disorders	2.07	0.11	35.90	.613
Comorbid disorders (Reference = absence)	Schizophrenia and substance use disorders	5.61	1.22	28.84	.030
	Schizophrenia and personality disorders	2.27	0.09	26.72	.535
Admission type (Reference = Voluntary admission)		2.85	0.75	12.92	.144
Previous length of stay		1.19	1.07	1.34	.002
Previous number of hospitalizations		0.92	0.81	1.02	.140

0-45) (see Table 1).

The RVP group had a median age of 38.63, versus 35.74 in the NRVP group; the proportion of men is high in both violent groups (55.88 in RVP group, 63.03, in NRVP group). A high proportion of RVPs (58.62%) lived in sheltered housing, while a high proportion of NRVPs lived as

Table 4
Logistic regression model on situational factors

Situational factors		Odds ratio	Lower CI 95%	Upper CI 95%	p
Results not adjusted for institutional and individual factors					
Trigger of the aggression	Not understandable provocation	1.19	0.69	2.07	.528
	Other patient(s)	0.17	0.04	0.66	.011
	Patient being denied something	1.16	0.69	1.95	.577
	Help with activities of daily living	1.97	0.49	7.96	.341
	Staff requiring patient to take medication	1.60	0.66	3.86	.297
	Other provocation(s)	0.77	0.46	1.29	.328
	Time of the incident	Morning (7h-12h)	1.4	0.78	2.51
Location of the incident	Afternoon (12h-18h)	1.14	0.74	1.74	.552
	Evening (18h-22h)	0.78	0.44	1.4	.406
	Night (22h-7h)	0.60	0.32	1.13	.116
Location of the incident	Patient's room	1.18	0.50	2.78	.702
	Seclusion room	0.92	0.46	1.84	.816
	Care areas	2.38	1.05	5.39	.040
	Communal areas	0.76	0.49	1.16	.198
Results adjusted for institutional and individual factors					
Trigger of the aggression	Not understandable provocation	1.01	0.52	1.97	.971
	Other patient(s)	0.16	0.03	0.83	.029
	Patient being denied something	1.38	0.74	2.57	.314
	Help with activities of daily living	2.95	0.67	12.95	.152
	Staff requiring patient to take medication	2.46	0.78	7.72	.123
	Other provocation(s)	0.79	0.44	1.43	.436
	Time of the incident	Morning (7h-12h)	1.42	0.76	2.65
Location of the incident	Afternoon (12h-18h)	1.04	0.62	1.73	.883
	Evening (18h-22h)	0.79	0.40	1.58	.509
	Night (22h-7h)	0.62	0.29	1.34	.226
Location of the incident	Patient's room	0.94	0.42	2.10	.870
	Seclusion room	1.69	0.71	4.00	.234
	Care areas	3.24	1.13	9.23	.028
	Communal areas	0.73	0.44	1.23	.241

couples or with their families (48.63). A high proportion of RVPs were not married (91.18%). Repetitive and non-repetitive violent patients have predominantly a diagnosis of schizophrenia (RVP group: 50%, NRVP group: 42.38%). The RVP group also has a high proportion of diagnosis of schizophrenia with co-morbid substance use disorders (20.59%). Most violent patients were admitted involuntarily (76.47 in the RVP group and 69.7 in the NRVP group). Over the study period, the median of previous length of stay was 185 days (range 3-1085) in the RVP group and 44 days (range 0-727) in the NRVP group. The median of previous hospitalizations was 1 (range 0-37) in the RVP group and 1 (0-18) in the NRVP group (see Table 1).

3.2. Descriptive characteristics of violent behaviors and situational factors of violent behavior

The sample contained 4319 NVPs (95.59 % of all patients), 165 NRVPs (3.65% of all patients), and 34 RVPs (0.75% of all patients and 17.08% of VPs). RVPs were engaged in 43.47% of all VB (180/414 VB). On average, each RVP was engaged in 5.29 VB (180/34), and each NRVP was engaged in 1.41 VB (234/165). Physical violence accompanied by verbal violence was the most frequent (48.31% of the VB), followed by physical violence alone (38.41 % of the VB). 81.16% of the VB were directed toward staff members. 37.92% of VB occurred in the afternoon and 40.34% in communal areas. In both groups, the violence occurred mainly in common area and seclusion rooms (see Table 1 and 2).

A logistic regression model on **individual** factors showed a significant association between living in sheltered housing before admission and the RVP group (OR = 5.45, $p < .01$, reference category: "Leaving alone"). We found a trend for an association between schizophrenia with substance use disorder and the RVP group, just above the significance level (OR=4.31, $p = .051$). We did not find any other significant link between individual characteristics and the RVP group (see Table 3).

A logistic regression model on **institutional** factors showed a significant link between previous length of stay and the RVP group (OR = 1.19, $p < .01$). We did not find any other significant link between institutional characteristics and the RVP group (see Table 3).

A logistic regression model on individual and institutional factors together showed a significant association between schizophrenia with substance use disorders and RVP group (OR=5.61, $p = .03$) and between previous length of stay and RVP group (OR = 1.19, $p < .01$) (see Table 3).

A Logistic regression models on **situational** factors showed a significant link between the location of the VB named "care areas" (including nursing offices and pharmacies) and the RVP group (OR=2.38, $p = .04$) and between a triggering factor in association with (an)other patient(s) and the NRVP group (OR=0.17, $p = .01$).

The second logistic regression models on situational factors, adjusted for both individual and institutional factors, showed similar results: a significant link between the "care areas" and the RVP group (OR=3.24, $p = .03$), and between a triggering factor in association with (an)other patient(s) and the NRVP group (OR=0.16, $p = .03$) (see Table 4).

Combined hierarchical effects of factors on the rate of VB

In order to describe the hierarchical importance of the factors associated with the NRVP or the RVP group, we drew up a Classification and Regression Tree (CART). The factors mentioned on the graph were decisive for distinguishing subgroups and each cell described the number of patients, and the percentage in each subgroup (see Graph I). CART analysis identified two main factors (among all individual and institutional factors) presented in decreasing order of importance: the length of the stay and the type of accommodation (sheltered housing vs. other types of accommodation). The analysis classified two groups of patients. The first, with a length of stay prior to aggression of less than 163 days (5.3 months), included 76.4% of the sample and was composed of 91% of NRVPs and 9% of RVPs. The second group, with a length of stay above 163 days (23.6% of the original sample), was composed of 57% of NRVPs and 43% of RVPs. In this subgroup, the type of accommodation prior to hospitalization dichotomized the tree in two further subgroups. The first included patients living alone or with partner/family members, which was composed of 72% of NRVPs and 28% of RVPs. The second included patients living in sheltered housing prior to hospitalization and was composed of 56 % of RVPs and 44% of NRVPs. Within this group, when the length of stay was above 368 days (12 months), we found 11 patients, 81% of whom were RVPs.

Fig. 1.

4. Discussion

In this study, we have explored the individual, institutional and situational factors linked to repetitive VB in psychiatric inpatients, independently and in a combined way. Results showed that repetitive VB were linked to living in sheltered housing prior to hospitalization and to a diagnosis of schizophrenia with substance abuse comorbidity (individual factors), as well as having longer hospital stays (institutional factors). Among situational factors, the risk of repetitive VB was linked to the care areas. Finally, when the combination of individual and institutional factors was considered, our results have demonstrated that the combined effects of length of stay and type of accommodation before hospitalization increased the likelihood of being in the RVP group.

In line with other studies (Barlow et al., 2000; Convit et al., 1990; Grassi et al., 2006; Grenyer et al., 2013; Kraus and Sheitman, 2004; Lussier et al., 2010; Owen et al., 1998), our results revealed that a small percentage of patients (0.75% of all hospitalized patients) have

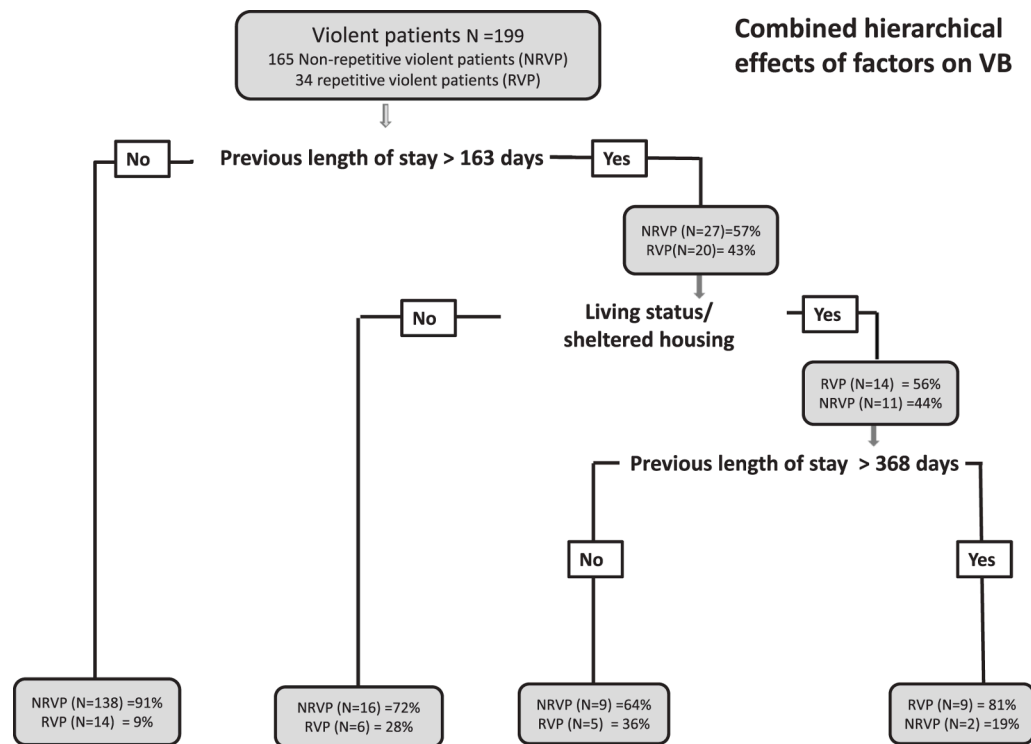


Fig. 1. Combined hierarchical effects of the factors studied on the likelihood of being in the Repetitive Violent Patients (RVP) group or in the Non-Repetitive Violent Patients (NRVP) group.

committed 43.5% of all VB and were each engaged in 5.3 VB on average. These results highlight the value of better knowing these patients and the conditions of the occurrence of VB for developing violence prevention strategies. It has to be noted that the percentage of RVPs is lower than that reported in other publications (between 1.4 and 21% (Lussier et al., 2010)). This difference may be related to some variations in the types of violence studied, or in the number of acts taken into account to characterize the repetition of violence (Flannery, 2002; Lussier et al., 2010). Other factors may also explain this difference, such as a variation in the assessment tool, in the hospitalization context (ward rules, atmosphere, etc.), or in the length of the study period (Abderhalden et al., 2007; Cornaggia et al., 2011; Dack et al., 2013; Grassi et al., 2006; Lussier et al., 2010).

Regarding situational factors, repetitive VB was more likely in nursing offices and pharmacies, where interactions between patients and staff are the most frequent. Various studies already mentioned the violence increase in these care spaces (Bowers et al., 2009; Lanza et al., 1991; Rasmussen and Levander, 1996), which are considered as potential trigger points for aggression (Bowers et al., 2009), in conjunction with patient symptomatology, irritability or agitation.

Descriptive results showed that in 87% of cases of repetitive VB, the aggression was toward caregivers. These difficulties could lead to both insecurity and difficulties in administering treatment (Edward et al., 2014; Hoptman et al., 1999) and impact other patients by creating negative attitudes towards them (Arnetz and Arnetz, 2001; Iozzino et al., 2015; Lion and Pasternak, 1973). Violence can also have effects on caregivers, affecting their overall health (Cornaggia et al., 2011; Wildgoose et al., 2003). These effects are likely to aggravate a situation and result in more adverse incidents (Bowers et al., 2007). Consequently, it is essential to provide training to help staff prevent and manage violence (Bowers et al., 2006).

Regarding individual factors, and in line with previous results on NRVPs (Dack et al., 2013; Flannery et al., 2018), we found that patients suffering from schizophrenia with substance use comorbidity and who lived in sheltered housing before hospitalization are more likely to

commit repetitive VB. In our region, sheltered housing classically welcomes vulnerable patients who need to be supported in their daily lives. As Uggerby (Uggerby et al., 2011) noticed, a significant proportion of schizophrenic patients who live in sheltered housing have other associated problems such as substance abuse (particularly cannabis and alcohol use), non-adherence to treatment, and behavioral disorders. This can complicate and worsen the effects of treatment and promote the development of VB. Unfortunately, in this study, we had no information on the severity of the psychopathology at the time of the aggressions and we cannot therefore test this hypothesis.

Regarding institutional factors, longer length of stay was linked to repetitive VB. CART analysis confirmed this first result. Moreover, the analysis identified a high-risk RVP subgroup, composed of patients who have stayed longer in hospital and who lived in sheltered housing prior to hospitalization. Longer length of hospital stays may reflect higher severity and chronicity of a patient's pathology, aggressive and hostile patient behavior, and difficulty of sheltered housing to serve as appropriate containing environment. The works of Gupta (Gupta et al., 1996) and Capdevielle (Capdevielle et al., 2009) showed that addictive comorbidity increases the length of stay, particularly in relation to patient non-compliance, while Citrome (Citrome et al., 1994) insists on the relationship between increase in stay duration and lack of appropriate and accessible accommodation support. In line with these studies, a longer hospital stay in our sample could include patients who have many difficulties to be managed by community services and sheltered housing (Grassi et al., 2006) and cannot be placed in an appropriate living place other than in the hospital.

Our results suggested that most identified RVPs have a schizophrenic pathology that is difficult to stabilize, probably because of comorbid substance abuse disorders. The possible resistance to treatment linked to the drug use (Swartz et al., 1998), the low tolerance for drug use in sheltered housing, the difficulty of sheltered housing to contain these patients, and probably the shelter housing's fears concerning these patients' behavior (agitation or aggressive) could contribute to increase the hospital stay lengths (Capdevielle et al., 2009; Cheng et al., 2016),

which in turn could contribute to repetitive VB occurrence.

4.1. Limitations

Our study has some limitations. Firstly, we did not have detailed data on the severity of the patients' psychopathologies. The severity of the psychopathology may be an important factor for violence, whether or not it is repetitive. In our study, we have no data on the severity of illness for each patient, both at the time of hospital admission and at the time of aggression. Therefore, it was not possible to determine whether violent patients were more seriously ill. Secondly, even though caregivers were comfortable using the SOAS-R, they may not have recorded all the VB. Thirdly, due to the particularity of situational factors, we were not able to integrate into the classification and regression tree the set of individual, situational and institutional factors in order to analyze the combinations of factors that were linked to repetitive violence. Fourthly, the results of this study are limited by the small number of RVPs. Lastly, several other situational factors (such as staff experience, crowding, or ward structure) could be linked to repetitive VB. A more in-depth analysis of interpersonal relationships and the institutional framework might perhaps provide a better understanding of these situations.

5. Conclusion

Our results seem to reflect the vulnerability of a small group of patients with schizophrenic disorders. These patients were difficult to stabilize and had a history of many days in hospital, during which violence were repeated. Early identification of patients' clinical and institutional profiles could help to develop strategies for relapse and VB prevention, and facilitate the choice of the most appropriate type of treatment and follow-up for these patients. These results encourage the development of alternatives to classic hospitalizations, such as intensive case-management, or networking between institutions, professionals and relatives. This would help to avoid gaps in care, as well as to promote the care continuity and the maintenance of gains after leaving the hospital (Bonsack et al., 2019).

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Declaration of Competing Interest

On behalf of all authors, the corresponding author states that there is no conflict of interest.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.psychres.2020.113643.

References

- Abderhalden, C., Needham, I., Dassen, T., Halfens, R., Fischer, J.E., Haug, H.-J., 2007. Frequency and severity of aggressive incidents in acute psychiatric wards in Switzerland. *Clin. Practice Epidemiol. Mental Health* 3 (1), 30.
- Arnetz, J.E., Arnetz, B.B., 2001. Violence towards health care staff and possible effects on the quality of patient care. *Soc. Sci. Med.* 52 (3), 417–427.
- Barlow, K., Grenyer, B., Ilkiw-Lavalle, O., 2000. Prevalence and precipitants of aggression in psychiatric inpatient units. *Aust. N. Z. J. Psychiatry* 34 (6), 967–974.
- Baxter, E., Hafner, R.J., Holme, G., 1992. Assaults by patients: the experience and attitudes of psychiatric hospital nurses. *Aust. N. Z. J. Psychiatry* 26 (4), 567–573.
- Bjorkly, S., 2013. A systematic review of the relationship between impulsivity and violence in persons with psychosis: Evidence or spin cycle? *Aggression Violent Behav.* 18 (6), 753–760.
- Blow, F.C., Barry, K.L., Copeland, L.A., McCormick, R.A., Lehmann, L.S., Ullman, E.J.P.S., 1999. Repeated assaults by patients in VA hospital and clinic settings. *50 (3)*, 390–394.

- Bonsack, C., Conus, P., Morandi, S., 2019. Alternatives à l'hospitalisation psychiatrique. *Rev. Med. Suisse* 1402–1406.
- Bowers, L., Allan, T., Simpson, A., Jones, J., Van Der Merwe, M., Jeffery, D., 2009. Identifying key factors associated with aggression on acute inpatient psychiatric wards. *Issues Ment. Health Nurs.* 30 (4), 260–271.
- Bowers, L., Allan, T., Simpson, A., Nijman, H., Warren, J., 2007. Adverse incidents, patient flow and nursing workforce variables on acute psychiatric wards: The Tompkins Acute Ward Study. *Int. J. Soc. Psychiatry* 53 (1), 75–84.
- Bowers, L., Nijman, H., Allan, T., Simpson, A., Warren, J., Turner, L., 2006. Prevention and management of aggression training and violent incidents on UK acute psychiatric wards. *Psychiatr. Serv.* 57 (7), 1022–1026.
- Bowers, L., Stewart, D., Papadopoulos, C., Dack, C., Ross, J., Khanom, H., 2011. Inpatient violence and aggression: a literature review. *Rep. Conflict Containment Reduc. Res. Prog.*
- Breiman, L., Friedman, J.H., Olshen, R.A., Stone, C.J., 1984. *Classification and regression trees*. Wadsworth, Belmont, CA.
- Broderick, C., Azizian, A., Kornbluh, R., Warburton, K.J.C.S., 2015. Prevalence of physical violence in a forensic psychiatric hospital system during 2011–2013: Patient assaults, staff assaults, and repeatedly violent patients. *20 (3)*, 319–330.
- Buuren, S.v., Groothuis-Oudshoorn, K.J.J.o.s.s., 2010. mice: Multivariate imputation by chained equations in R. 1–68.
- Capdevielle, D., Ritchie, K., Villebrun, D., Boulenger, J.-P., 2009. Durées d'hospitalisation des patients souffrant de schizophrénie: facteurs cliniques de variations et leurs conséquences. *L'Encéphale* 35 (1), 90–96.
- Carmel, H., Hunter, M., 1989. Staff injuries from inpatient violence. *Psychiatr. Serv.* 40 (1), 41–46.
- Cheng, J.E., Shumway, M., Leary, M., Mangurian, C.V.J.C.m.h.j., 2016. Patient factors associated with extended length of stay in the psychiatric inpatient units of a large urban county hospital. *52 (6)*, 658–661.
- Chou, K.-R., Lu, R.-B., Mao, W.-C., 2002. Factors relevant to patient assaultive behavior and assault in acute inpatient psychiatric units in Taiwan. *Arch. Psychiatr. Nurs.* 16 (4), 187–195.
- Citrome, L., Green, L., Fost, R.J.P.S., 1994. Length of stay and recidivism on a psychiatric intensive care unit. *45 (1)*, 74–76.
- Convit, A., Isay, D., Otis, D., Volavka, J., 1990. Characteristics of repeatedly assaultive psychiatric inpatients. *Psychiatr. Serv.* 41 (10), 1112–1115.
- Cornaggia, C.M., Beghi, M., Pavone, F., Barale, F., 2011. Aggression in psychiatry wards: a systematic review. *Psychiatry Res.* 189 (1), 10–20.
- Dack, C., Ross, J., Papadopoulos, C., Stewart, D., Bowers, L., 2013. A review and meta-analysis of the patient factors associated with psychiatric in-patient aggression. *Acta Psychiatr. Scand.* 127 (4), 255–268.
- Decaire, M.W., Bédard, M., Riendeau, J., Forrest, R., 2006. Incidents in a psychiatric forensic setting: association with patient and staff characteristics. *CJNR (Can. J. Nurs. Res.)* 38 (3), 68–80.
- Edward, K.-I., Ousey, K., Warelou, P., Lui, S., 2014. Nursing and aggression in the workplace: a systematic review. *Br. J. Nurs.* 23 (12), 653–659.
- Flannery, J.R., 2007. Precipitants to psychiatric patient assaults: review of findings, 2004–2006, with implications for EMS and other health care providers. *Int. J. Emerg. Ment. Health* 9 (1), 5–11.
- Flannery, J.R., Walker, A.P.J.I.j.o.e.m.h., 2008. Repetitively assaultive psychiatric patients: fifteen-year analysis of the Assaulted Staff Action Program (ASAP) with implications for emergency services. *10 (1)*, 1–8.
- Flannery, R.B., 2002. Repetitively assaultive psychiatric patients: Review of published findings, 1978–2001. *Psychiatr. Q.* 73 (3), 229–237.
- Flannery, R.B., Wyshak, G., Flannery, G.J.J.P.q., 2018. Characteristics of international assaultive psychiatric patients, 89. review of published findings, pp. 349–357, 2013–2017.
- Flannery, R.B., Wyshak, G., Tecce, J.J., Flannery, G.J., 2014. Characteristics of international assaultive psychiatric patients: review of published findings, 2000–2012. *Psychiatr. Q.* 85 (3), 303–317.
- Gadon, L., Johnstone, L., Cooke, D., 2006. Situational variables and institutional violence: a systematic review of the literature. *Clin. Psychol. Rev.* 26 (5), 515–534.
- Grassi, L., Biancosino, B., Marmai, L., Kotrotsiou, V., Zanchi, P., Peron, L., Marangoni, C., Vanni, A., Barbui, C., 2006. Violence in psychiatric units. *Soc. Psychiatry Psychiatr. Epidemiol.* 41 (9), 698–703.
- Grenyer, B.F., Lewis, K.L., Ilkiw-Lavalle, O., Deane, R., Milicevic, D., Pai, N., 2013. The developmental and social history of repetitively aggressive mental health patients. *Aust. N. Z. J. Psychiatry* 47 (5), 463–469.
- Groleau, R., Da Silva Guerreiro, J., 2019. Aggression en milieu psychiatrique fermé: identification des déclencheurs qui précèdent les agressions contre les intervenants. *Revue de psychoéducation* 48 (1), 45–68.
- Gupta, S., Hendricks, S., Kenkel, A.M., Bhatia, S.C., Haffke, E.A.J.S.R., 1996. Relapse in schizophrenia: is there a relationship to substance abuse? *20 (1-2)*, 153–156.
- Hoptman, M.J., Yates, K.F., Patalinjung, M.B., Wack, R.C., Convit, A., 1999. Clinical prediction of assaultive behavior among male psychiatric patients at a maximum-security forensic facility. *Psychiatr. Serv.* 50 (11), 1461–1466.
- Iozzino, L., Ferrari, C., Large, M., Nielsens, O., De Girolamo, G., 2015. Prevalence and risk factors of violence by psychiatric acute inpatients: a systematic review and meta-analysis. *PLoS One* (6), 10.
- Krakowski, M.I., Convit, A., Jaeger, J., Lin, S., Volavka, J., 1989. Inpatient violence: trait and state. *J. Psychiatr. Res.* 23 (1), 57–64.
- Kraus, J.E., Sheitman, B., 2004. Characteristics of violent behavior in a large state psychiatric hospital. *Psychiatr. Serv.* 55 (2), 183–185.
- Lanza, M.L., Kayne, H.L., Hicks, C., Milner, J.J.I.i.m.h.N., 1991. Nursing staff characteristics related to patient assault. *12 (3)*, 253–265.

- Lee, Y., Nelder, J.A., Pawitan, Y., 2006. Generalized linear models with random effects: unified analysis via H-likelihood. CRC Press.
- Lion, J.R., Pasternak, S.A., 1973. Countertransference reactions to violent patients. *Am. J. Psychiatry* 130 (2), 207–210.
- Lussier, P., Verdun-Jones, S., Deslauriers-Varin, N., Nicholls, T., Brink, J., 2010. Chronic violent patients in an inpatient psychiatric hospital: Prevalence, description, and identification. *Criminal Justice Behav.* 37 (1), 5–28.
- McCullagh, P., Nelder, J.J.S.b.o.g.l.m., 1989. Generalized linear models., 2nd edn. Chapman and Hall, London.
- Moulin, V., Golay, P., Palix, J., Baumann, P., Gholamrezaee, M., Azzola, A., Gasser, J., Do, K., Alameda, L., Conus, P., 2018. Impulsivity in early psychosis: A complex link with violent behaviour and a target for intervention. *Eur. Psychiatry* 49, 30–36.
- Moulin, V., Palix, J., Golay, P., Dumais, A., Gholamrezaee, M.M., Azzola, A., Baumann, P. S., Alameda, L., Conus, P., 2017. Violent behaviour in early psychosis patients: Can we identify clinical risk profiles? *early Intervention in Psychiatry*.
- Needham, I., Abderhalden, C., Halfens, R.J., Fischer, J.E., Dassen, T., 2005. Non-somatic effects of patient aggression on nurses: a systematic review. *J. Adv. Nurs.* 49 (3), 283–296.
- Nijman, H.L., Muris, P., Merckelbach, H.L., Palmstierna, T., Wistedt, B., Vos, A., van Rixtel, A., Allertz, W., 1999. The staff observation aggression scale-revised (SOAS-R). *Aggressive Behav.* 25 (3), 197–209.
- Organization, W.H., 2004. International statistical classification of diseases and related health problems. World Health Organization.
- Owen, C., Tarantello, C., Jones, M., Tennant, C., 1998. Repetitively violent patients in psychiatric units. *Psychiatr. Serv.* 49 (11), 1458–1461.
- Quanbeck, C.D., McDermott, B.E., Lam, J., Eisenstark, H., Sokolov, G., Scott, C.L., 2007. Categorization of aggressive acts committed by chronically assaultive state hospital patients. *Psychiatr. Serv.* 58 (4), 521–528.
- Rasmussen, K., Levander, S.J.J.o.I.V., 1996. Individual rather than situational characteristics predict violence in a maximum security hospital. 11 (3), 376-390.
- Rippon, T.J., 2000. Aggression and violence in health care professions. *J. Adv. Nurs.* 31 (2), 452–460.
- Rund, B.R., 2018. A review of factors associated with severe violence in schizophrenia. *Nord. J. Psychiatry* 72 (8), 1–11.
- Sanghani, S.N., Marsh, A.N., John, M., Soman, A., Lopez, L.V., Young, Y.A., Russ, M.J.J.J. o.p.p., 2017. Characteristics of patients involved in physical assault in an acute inpatient psychiatric setting. 23 (4), 260-269.
- Schall, R., 1991. Estimation in generalized linear models with random effects. *Biometrika* 78 (4), 719–727.
- Shepherd Mélanie, L.T., 1999. Putting aggression into context: An investigation into contextual factors influencing the rate of aggressive incidents in a psychiatric hospital. *J. Mental Health* 8 (2), 159–170.
- Steinert, T., 2002. Prediction of inpatient violence. *Acta Psychiatr. Scand.* 106 (s412), 133–141.
- Swartz, M.S., Swanson, J.W., Hiday, V.A., Borum, R., Wagner, H.R., Burns, B.J., 1998. Violence and severe mental illness: the effects of substance abuse and nonadherence to medication. *Am. J. Psychiatry* 155 (2), 226–231.
- Tardiff, K., Sweillam, A., 1982. Assaultive behavior among chronic inpatients. *Am. J. Psychiatry* 139 (2), 212–215.
- Team, R.C., 2019. A language and environment for statistical computing, 2012. R Foundation for Statistical Computing, Vienna, Austria. URL: <https://www.R-project.org>.
- Uggerby, P., Nielsen, R.E., Correll, C.U., Nielsen, J.J.S.R., 2011. Characteristics and predictors of long-term institutionalization in patients with schizophrenia. 131 (1-3), 120-126.
- Vandamme, M.-J., 2009. Schizophrénie et violence: facteurs cliniques, infracliniques et sociaux. *Annales Médico-Psychologiques* 167 (6), 629–637.
- Welsh, E., Bader, S., Evans, S.E., 2013. Situational variables related to aggression in institutional settings. *Aggression Violent Behav.* 18 (6), 792–796.
- Wildgoose, J., Briscoe, M., Lloyd, K., 2003. Psychological and emotional problems in staff following assaults by patients. *The Psychiatrist* 27 (8), 295–297.