Soc Psychiatry Psychiatr Epidemiol (2017) 52:979–987
DOI 10.1007/s00127-017-1363-3

ORIGINAL PAPER

Risk factors of coercion among psychiatric inpatients: a nationwide register-based cohort study

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Received: 7 July 2016 / Accepted: 16 February 2017 / Published online: 2 March 2017

Abstract
Purpose Reducing the use of coercion among patients with mental disorders has long been a political priority. However, risk factors for coercive measures have primarily been investigated in smaller studies. To reduce the use of coercion, it is crucial to identify people at risk which we aim to do in this first large-scale study.
Methods A cohort study was conducted among all psychiatric inpatients in Denmark, following 112,233 individuals during 1999–2014. Data from Danish registers were analysed using logistic regression for repeated measures.
Results 24,594 inpatients were exposed to a coercive measure (21.9%). Clinical characteristics were the foremost predictors of coercion and patients with organic mental disorder had the highest increased risk of being subjected to a coercive measure (OR = 5.56; 95% CI = 5.04, 6.14). The risk of coercion was the highest in the first admission and decreased with the number of admissions (all $p < 0.001$). The following socioeconomic variables were associated with an increased risk of coercion: male sex, unemployment, lower social class and immigrants from low and middle income countries (all $p < 0.001$). Early retirement and social relations, such as being married and having children, reduced the risk of being subjected to coercive measure (all $p < 0.05$).
Conclusion From our nationwide data, we identified a broad range of risk factors associated with coercive measures. Our findings can assist researchers in identifying patients at risk of coercion and thereby help targeting new coercion reduction programs.

Keywords Psychiatry · Coercion · Risk factors · Inpatient · Epidemiology

Electronic supplementary material The online version of this article (doi:10.1007/s00127-017-1363-3) contains supplementary material, which is available to authorized users.

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Introduction

The use of coercive measures as a last resort in clinical psychiatry is controversial. The clinical appropriateness and ethicality of such measures are hotly debated, and reducing their use in psychiatry has long been a political and clinical priority [1–4]. Nevertheless, coercive measures remain widely used even though coercion is employed only when all less restrictive approaches have been unsuccessful [2, 5].

Studies have shown a 21–59% variation in the frequency of coercive-measure use among psychiatric inpatients across Europe [2]. These variations have been explained by international differences in laws and clinical practice [2, 6, 7]. The failure to markedly reduce the use of coercive measures has been explained by the lack of knowledge of identifying those patients at risk for coercive measures, which is crucial for developing early intervention strategies to reduce the use of coercion [3, 4].

A recent review divided predictors of coercion into three categories: patient characteristics, staff composition, and ward-related factors [5]. The use of coercion regarding patient characteristics has been found to be associated with male sex, patients with psychosis, substance abuse, aggressive behavior, lifetime history of trauma, and low satisfaction with previous treatment [5, 8]. Staff composition at psychiatric wards with few junior doctors was seemingly associated with higher use of coercion [5, 9]. For ward-related factors, higher rates of seclusion and restraint were found in hospitals in urban areas and in locked-doors wards [5]. Although multiple studies have investigated various predictors of coercive measures, the premise for coercion use and which factors predict coercion remain unclear. The lack of large-scale studies with long-term follow-up could account for this [1, 4, 5, 10, 11]. No population-based studies investigating a broad selection of variables exist. Previous studies have mainly investigated one type of coercion in a subgroup and have not included other coercive measures during hospitalization.

This study is the largest to date utilizing the unique Danish registers in which registration of every coercive measure is mandatory. The objective of this prospective nationwide register-based cohort study was to longitudinally investigate a broad selection of risk factors among psychiatric inpatients in Denmark that can lead to coercive measures. We looked at "any coercive measure" as the main outcome and, more specifically, as a secondary outcome: compulsory admission/involuntary detainment, restraint, and forced treatment. Additionally, subgroup analysis was conducted on young individuals to determine predictors of first-time coercion and incidence of coercive measures among all inpatients with full follow-up from adulthood.

Methods

Registers

The Danish Civil Registration System was established in 1968. It provides information on the identity and vital- and living status of all individuals resident in Denmark [12]. All individuals are assigned a unique personal identification number, ensuring accurate linkage between the different registers. The Register of National Coercive Measures in Psychiatric Treatment is an almost complete register of all coercive measures recorded in Denmark from 1999 because all psychiatric inpatient facilities in Denmark are legally mandated to report every coercive measure [13]. The Danish Psychiatric Central Register (PCRR) holds information on all psychiatric admissions in Denmark from April 1, 1969, and from 1995 psychiatric outpatients' treatment has also been included [14]. The diagnostic system used until December 31, 1993 was ICD-8 and from January 1, 1994, the ICD-10 classification was used [14].

In Denmark, it is mandatory for men to attend conscription around the age of 19 years. The Danish Conscription Registry holds information on IQ measurements, and nationwide data are available for 2006–2014. We obtained information from Statistics Denmark on the degree of urbanity using the register's 'size of dwelling', which was available for 1999–2004 and for 2006–2014 [15, 16]. The Integrated Database for Labor Market Research holds data on labor market status covering the entire population and data were gathered annually for 1980–2012 [17]. The income register holds information on annual income and public dependence for 1980–2013 [18]. Information on education and grade was obtainable for 1999–2014 [19, 20]. Lastly, Statistics Denmark provided information on immigration for 1999–2014 and refugee status for 1999–2013 [21, 22].

Study population

Using data from the Danish Civil Registration System, we obtained a nationwide cohort of all individuals born during January 1, 1951–December 31, 1996 and alive at the beginning of the study period 1999–2014. The study population included all individuals aged 18–63 years with a psychiatric inpatient admission during January 1, 1999–December 31, 2014. Online Resource Table S1 shows sociodemographic and clinical characteristics from all inpatients' first admission.

Assessment of clinical variables

Psychiatric main diagnoses were coded according to the ICD-10 categories (F00-F99) given at discharge of any admission, and diagnostic codes are described in Online Resource Appendix 1 [23]. Secondary diagnoses for substance use disorders were also included. Admission status was divided into planned admission or acute admission. A patient's previous psychiatric history was identified in the PCRR based on the number of contacts to a psychiatric hospital before the coercion was registered. Hospital admissions associated with self-harm (SH) were identified using the definitions listed in Online Resource

Appendix 1 [24]. They were included in the analysis if recorded within the past 6 months before coercion. Parental psychiatric history was defined as any inpatient psychiatric contact. Any clinical treatment received outside the hospital was defined as contact with psychiatric outpatient treatment during the year preceding the present coercion.

Assessment of sociodemographic variables

Sociodemographic factors on education, ethnicity and urbanity were assessed annually in December. Patients' living status was divided into three categories: (1) living alone/not married, (2) married, (3) divorced/widow. Whether patients had any children was dichotomized into yes and no. Personal and parental education levels were categorized into four groups: ground school, high school, vocational training, and bachelor's degree or higher. A person's grade was divided into high and low and was registered as the mean of the last completed education. IQ was converted from Børge Priens Prøve, which is an intelligence test the Danish Military Draft Board uses and therefore primarily available for men [25, 26]. Labor market affiliation was divided into four categories: (1) employed (2) unemployed, (3) early retirement, and (4) pension. Gross annual income was grouped into age–sex–year population-based quartiles for the entire population and includes wages, pensions, social security benefits and unemployment. The degree of urbanization was grouped into a three-level classification: the capital area, which includes Copenhagen and its suburbs; provincial areas; and rural areas [27]. Countries of origin were divided into the largest geographical area and income level according to the WHO guidelines [28]. Immigration was categorized into Danish-born individuals, immigrants and refugees.

Assessment of coercive measures

The Danish Mental Health Act states that coercion is defined as measures that a patient opposes, and the danger or treatment criteria must be fulfilled for an involuntary commitment or involuntary detention to take place [7]. Coercive measures are defined as compulsory admission, involuntarily detained, restraint and forced treatment. Additional information is given in Online Resource Appendix 1. From 1999 to 2004 each coercive measure is registered and coded 1, and from January 1, 2005 the measures are coded differently as: (1) compulsory admission, (2) involuntary detention, (3) restraint and (4) forced treatment (Online Resource Appendix 1).

Statistical analysis

Descriptive statistics were used to show the distribution of variables in the cohort at the first admission and the percentage of patients experiencing any coercive measure (Online Resource Table S1).

Data were analyzed using logistic regression for repeated measures with separate models for each outcome: (I) compulsory admission/ involuntary detainment, (II) restraint, (III) forced treatment, and (IV) any coercive measure [29]. In each analysis the individuals were followed until occurrence of the first coercion of the type being analyzed or until censoring at death, emigration or end of follow-up (December 31, 2014), whichever came first. Predictor variables were updated at each admission. The binary response variable indicated, for each admission, whether a given coercive measure was applied (yes/no). Both univariate and multiple logistic regression models were used to investigate the association between predictors and the four definitions of coercion. The logistic regression models were fitted using the method of generalized estimating equations, which takes into account that a person can contribute with more than one record in the analyses. The sub-populations of young individuals were analysed separately. The *p*-value and the 95% confidence interval (CIs) were based on Wald's test. Analyses were adjusted for sex, age and calendar year. Data were analysed using R, version 3.2.3 (R package 'geepack' version 1.2-0.2) statistical software.

Results

From 1999 to 2014, a total of 112,233 persons had an inpatient psychiatric admission. During that period, 24,594 (21.9%) inpatients were exposed to at least one coercive measure. A total of 21,086 (18.8%) patients experienced compulsory admission or were detained: 15,953 (14.2%) had been restrained and 4336 (3.9%) were given forced treatment.

Clinical predictors of any coercive measure

In the fully adjusted analyses (Table 1), all diagnostic categories show an increased risk of being subjected to any coercive measure compared with anxiety disorders. Patients diagnosed with organic mental disorder (OR = 5.56; 95% CI = 5.04, 6.14), mental retardation (OR = 3.78; 95% CI = 3.20, 4.46) or schizophrenia (OR = 3.67; 95% CI = 3.47, 3.88) had the highest risk. When analyzing the variable admission type, patients had more than twice the odds of being coerced when acutely admitted to a hospital (OR = 2.15; 95% CI = 2.00, 2.30). If patients had received outpatient care in the preceding

Table 1 Fully adjusted model for association between clinical variables and coercive measures[a]

Variables	Any coercion		CA/detained		Restraint		Forced treatment	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Main diagnosis								
Anxiety disorders	1.00	Reference	1.00	Reference	1.00	Reference	1.00	Reference
Organic mental disorder	5.56	5.04–6.14**	5.23	4.72–5.79**	7.84	6.94–8.86**	12.25	9.88–15.20**
Substance use disorders	1.92	1.79–2.06**	1.84	1.70–1.98**	2.78	2.53–3.06**	2.22	1.79–2.76**
Schizophrenia disorders	3.67	3.47–3.88**	3.60	3.39–3.82**	4.68	4.32–5.06**	8.20	6.92–9.73**
Affective disorders	1.35	1.27–1.43**	1.24	1.17–1.32**	2.18	2.01–2.36**	1.80	1.49–2.17**
Behavioral syndromes	1.85	1.57–2.19**	1.91	1.60–2.28**	2.15	1.73–2.68**	6.68	4.90–9.12**
Personality disorders	1.37	1.26–1.48**	1.27	1.16–1.38**	1.94	1.75–2.15**	1.97	1.57–2.47**
Mental retardation	3.78	3.20–4.46**	3.01	2.51–3.62**	5.24	4.30–6.38**	2.83	1.71–4.68**
Developmental disorders	3.38	2.84–4.03**	2.97	2.46–3.59**	4.70	3.81–5.80**	4.12	2.56–6.62**
Attention-deficit hyperactivity disorders	1.88	1.65–2.14**	1.72	1.49–1.97**	2.49	2.10–2.95**	2.38	1.61–3.51**
Other	2.35	2.14–2.58**	1.42	1.27–1.59**	3.70	3.30–4.16**	6.07	4.86–7.57**
Substance abuse								
No	1.00	Reference	1.00	Reference	1.00	Reference	1.00	Reference
Yes	1.10	1.05–1.16**	1.06	1.01–1.12*	1.13	1.07–1.20**	0.86	0.78–0.96*
Self-harm								
No	1.00	Reference	1.00	Reference	1.00	Reference	1.00	Reference
Yes	1.37	1.17–1.60**	1.46	1.24–1.71**	1.26	1.06–1.50*	1.93	1.52–2.45**
Admission type								
Planned	1.00	Reference	1.00	Reference	1.00	Reference	1.00	Reference
Acute	2.15	2.00–2.30**	2.39	2.20–2.59**	2.09	1.92–2.27**	1.32	1.15–1.51**
Previous admissions								
0	1.00	Reference	1.00	Reference	1.00	Reference	1.00	Reference
1–5	0.50	0.49–0.52**	0.49	0.48–0.51**	0.65	0.63–0.68**	0.68	0.62–0.74**
At least 6	0.14	0.14–0.15**	0.15	0.14–0.15**	0.25	0.24–0.27**	0.30	0.27–0.33**
Parents' psychiatric history								
No	1.00	Reference	1.00	Reference	1.00	Reference	1.00	Reference
Yes	1.04	0.99–1.09	1.03	0.98–1.08	1.02	0.97–1.08	0.98	0.89–1.08
Outpatient treatment								
No	1.00	Reference	1.00	Reference	1.00	Reference	1.00	Reference
Yes	1.45	1.37–1.52**	1.36	1.29–1.44**	1.60	1.51–1.70**	1.87	1.69–2.06**

Fully adjusted model for sex, age, calendar period, psychiatric diagnosis, substance abuse, deliberate self-harm, admission type, previous admissions, parents' psychiatric history and outpatient treatment

OR odds ratio, *CA* compulsory admission

*$P < 0.05$; **$P < 0.001$

12 months, the risk increased of being subjected to any coercive measure (OR = 1.45; 95% CI = 1.37, 1.52). Suicidal behavior was also associated with a higher risk of any coercive measure (OR = 1.37; 95% CI = 1.17, 1.60). However, patients who had at least six prior hospital contacts were less likely to be coerced (OR = 0.14; 95% CI = 0.14, 0.15). We found similar results in the basic analyses (Online Resource Table S2), although a reverse association was found among patients who had substance abuse or suicidal behavior in relation to the risk of coercion.

Many of the same predictors were observed regarding the specific coercion method. The highest risk estimates for being subjected to forced treatment were found for patients diagnosed with organic mental disorder who had an increased OR of 12.25 (95% CI = 9.88, 15.20) (Table 1).

Sociodemographic predictors of any coercive measure

In the fully adjusted analyses (Table 2), we found that male patients had a slightly higher risk of being exposed to any coercive measure (OR = 1.15; 95% CI = 1.10, 1.20).

Table 2 Fully adjusted model for association between sociodemographic variables and coercive measures among psychiatric inpatients

Variables	Any coercion		CA/detained		Restraint		Forced treatment	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Sex								
Female	1.00	Reference	1.00	Reference	1.00	Reference	1.00	Reference
Male	1.15	1.10–1.20**	1.11	1.06–1.17**	1.17	1.11–1.23**	0.88	0.81–0.97*
Age								
18–30	1.00	Reference	1.00	Reference	1.00	Reference	1.00	Reference
31–40	0.88	0.83–0.92**	0.90	0.85–0.96**	0.83	0.78–0.88**	1.11	0.99–1.25
41–50	0.97	0.91–1.03	1.00	0.94–1.07	0.89	0.83–0.95**	1.25	1.10–1.41**
51–63	1.17	1.08–1.26**	1.24	1.15–1.35**	1.02	0.93–1.12	1.58	1.35–1.85**
Education								
Ground school	1.00	Reference	1.00	Reference	1.00	Reference	1.00	Reference
High school	0.99	0.94–1.04	0.97	0.92–1.02	0.99	0.93–1.04	0.84	0.77–0.93**
Vocational	0.95	0.82–1.10	0.95	0.82–1.11	1.03	0.87–1.22	1.11	0.84–1.45
Bachelor's degree or higher	1.06	0.99–1.14	1.01	0.94–1.09	1.13	1.04–1.23*	1.13	0.99–1.31
Labor market status								
Employed	1.00	Reference	1.00	Reference	1.00	Reference	1.00	Reference
Unemployed	1.17	1.11–1.24**	1.16	1.09–1.24**	1.12	1.04–1.20*	1.50	1.32–1.70**
Early retirement	0.69	0.65–0.72**	0.69	0.66–0.73**	0.80	0.75–0.85**	1.09	0.99–1.2
Pension	1.07	0.79–1.46	1.07	0.77–1.47	1.05	0.72–1.55	0.86	0.38–1.94
Income								
Low	1.00	Reference	1.00	Reference	1.00	Reference	1.00	Reference
Lower medium	0.79	0.75–0.84**	0.78	0.74–0.83**	0.84	0.79–0.90**	0.86	0.77–0.96*
Higher medium	0.71	0.67–0.76**	0.71	0.67–0.75**	0.76	0.71–0.81**	0.79	0.70–0.89**
High	0.81	0.77–0.86**	0.80	0.75–0.85**	0.84	0.79–0.90**	0.72	0.63–0.82**
Civil status								
Living alone/not married	1.00	Reference	1.00	Reference	1.00	Reference	1.00	Reference
Married	0.81	0.77–0.86**	0.79	0.75–0.85**	0.81	0.75–0.87**	0.59	0.52–0.66**
Divorced/widowed	0.82	0.77–0.88**	0.84	0.78–0.90**	0.81	0.75–0.87**	0.77	0.68–0.87**
Children								
No	1.00	Reference	1.00	Reference	1.00	Reference	1.00	Reference
Yes	0.92	0.87–0.97*	0.94	0.89–0.99*	0.89	0.83–0.94**	0.82	0.74–0.91**
Urbanity								
Rural	1.00	Reference	1.00	Reference	1.00	Reference	1.00	Reference
Provincial	0.92	0.87–0.96**	0.93	0.88–0.98**	0.96	0.91–1.02	0.99	0.89–1.10
Capital	0.96	0.90–1.01	0.98	0.92–1.04	0.96	0.90–1.03	1.00	0.89–1.12
Immigration								
Danish	1.00	Reference	1.00	Reference	1.00	Reference	1.00	Reference
Immigrants	1.01	0.88–1.16	1.00	0.87–1.16	0.99	0.85–1.17	1.01	0.79–1.29
Country of origin								
African	1.00	Reference	1.00	Reference	1.00	Reference	1.00	Reference
America	0.91	0.60–1.40	0.90	0.59–1.38	0.95	0.59–1.53	0.78	0.40–1.50
East Mediterranean	0.76	0.57–1.01	0.71	0.53–0.95*	0.81	0.59–1.11	0.49	0.32–0.75*
Europe	0.66	0.50–0.89*	0.62	0.46–0.82*	0.70	0.51–0.97*	0.47	0.31–0.73**
South-East Asia	1.12	0.78–1.60	1.13	0.79–1.62	1.09	0.73–1.62	0.65	0.35–1.20
Western Pacific	1.17	0.80–1.70	1.10	0.75–1.62	1.12	0.74–1.71	0.81	0.43–1.51
Countries' income level								
High income	1.00	Reference	1.00	Reference	1.00	Reference	1.00	Reference

Table 2 (continued)

Variables	Any coercion		CA/detained		Restraint		Forced treatment	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Low and middle- income	1.65	1.42–1.92**	1.58	1.35–1.84**	1.67	1.40–1.99**	1.73	1.30–2.30**

Fully adjusted model for sex, age, calendar period, education, labor market status, income, civil status, children, urbanity, immigration, country of origin and countries' income level

OR odds ratio, *CA* compulsory admission

*$P < 0.05$; **$P < 0.001$

Patients in the age group above 51 years had the most elevated risk of coercion (OR = 1.17; 95% CI = 1.08, 1.26). Immigrants in general did not have an increased risk of coercion; however, immigrants from a low and middle income country were more likely to be subjected to a coercive measure (OR = 1.65; 95% CI = 1.42, 1.92). The analyses pointed to a decrease in coercion for patients who were married (OR = 0.81; 95% CI = 0.77, 0.86) and patients with at least one child (OR = 0.92; 95% CI = 0.87, 0.97). We also found that patients who had retired early had a decreased risk of being coerced (OR = 0.69; 95% CI = 0.65, 0.72). In the basic analyses (Online Resource Table S3) patients who had the highest education level, were unemployed or had parents who were unemployed had increased risks of being coerced, but not in the fully adjusted model.

When studying the specific coercion method, many of the same predictors were observed. Thus, in the fully adjusted analyses, higher risks were seen in patients with no attachment to the labor market and those from countries with a low and middle income.

Sensitivity analysis

In the sensitivity analysis of the young cohort with full follow-up of coercion from adulthood (Table 3), we found results similar to those of the main analysis; however, additional predictor variables were added into the analysis. We found that individuals whose parents were unemployed (OR = 1.23; 95% CI = 1.07, 1.42) and those whose parents had retired early (OR = 1.23; 95% CI = 1.12, 1.36) had an increased risk of being subjected to a coercive measure. In the basic analysis, no significant associations were found between coercion and patients' IQ level and grade (Online Resource Table S4).

Discussion

To our knowledge this nationwide study is the largest study to date conducted on predictors of coercive measures among psychiatric inpatients. Our study shows that clinical characteristics are the predictors with the highest relative risk of any coercive measure and that sociodemographic characteristics contribute to a lesser extent. We found that the risk of coercive measures was increased the most in patients with organic mental disorder, mental retardation and schizophrenia compared with that of anxiety disorders. Moreover, coercion was associated with suicidal behavior, acute admission, ongoing outpatient treatment, male sex, unemployed labor status, and being from low and middle income countries.

We found that 21.8% of all psychiatric inpatients were exposed to at least one coercive measure, which is in line with previous European studies showing a frequency of use of coercive measures that varied 21–59% [2].

Clinical predictors

The clinical predictors with the greatest association with coercion were organic mental disorder, mental retardation and schizophrenia, which is in line with previous studies [1]. Notably, patients with organic mental disorder had more than a fivefold elevated odds of any coercive measure and more than a 12-fold elevated odds of forced treatment. This patient group is also treated in somatic hospitals and includes organic delirium, which underlines the necessity of new intervention studies taking into account organizational factors and the complexity of differential diagnoses overlapping somatic and psychiatric care. Patients with a first-time admission were more likely to be subjected to all categories of coercion. This finding combined with the association with lower risk of coercion for patients with more frequent admissions could be explained by the preventive effect of patients being admitted before their illness seriously worsens. But this might also be the result of closer contact is a proxy for something else—such as more insight or more adherence or less severe symptoms. In line with suggestions from other studies, interventions focusing on patient involvement may be an effective strategy to reduce coercive measures [4]. In the fully adjusted analyses, we also found that substance use disorder and substance abuse, either as primary or secondary diagnosis, was a predictor of being subjected to any coercive measure, a finding that concurs with that of other studies [5, 30]. In

Table 3 Fully adjusted model for association between predictors and coercive measures in young sub-population 18–33 years

Variables	Any coercion		CA/detained		Restraint		Forced treatment	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Parents' education								
Ground school	1.00	Reference	1.00	Reference	1.00	Reference	1.00	Reference
High school	1.03	0.96–1.11	1.04	0.95–1.12	1.02	0.94–1.12	1.10	0.93–1.32
Vocational	1.06	0.91–1.25	1.06	0.90–1.26	1.05	0.87–1.27	1.27	0.89–1.80
Bachelor's degree or higher	1.08	0.99–1.18	1.07	0.98–1.17	1.09	0.99–1.20	1.09	0.90–1.33
Parents labor status								
Employed	1.00	Reference	1.00	Reference	1.00	Reference	1.00	Reference
Unemployed	1.23	1.07–1.42*	1.17	1.00–1.36	1.28	1.09–1.51*	1.16	0.83–1.64
Early retirement	1.23	1.12–1.36**	1.17	1.06–1.30*	1.24	1.10–1.38**	1.06	0.85–1.33
Pension	1.07	0.99–1.15	1.05	0.96–1.14	1.04	0.95–1.14	1.09	0.91–1.29
Urbanity								
Rural	1.00	Reference	1.00	Reference	1.00	Reference	1.00	Reference
Provincial	1.02	0.95–1.09	1.02	0.95–1.10	1.06	0.97–1.15	1.27	1.07–1.52*
Capital	1.06	0.98–1.15	1.09	1.00-1.19*	1.09	0.99–1.20	1.17	0.97–1.42
Main diagnosis								
Anxiety disorders	1.00	Reference	1.00	Reference	1.00	Reference	1:00	Reference
Organic mental disorder	3.72	3.04–4.55**	3.51	2.83–4.35**	4.86	3.83–6.17**	7.67	4.61–12.78**
Substance use disorders	2.92	2.63–3.25**	2.77	2.48–3.11**	3.97	3.44–4.57**	3.52	2.37–5.22**
Schizophrenia disorders	3.21	2.92–3.54**	3.14	2.83–3.47**	3.77	3.30–4.30**	7.97	5.66–11.22**
Affective disorders	1.29	1.16–1.44**	1.20	1.07–1.35*	1.84	1.59–2.12**	1.84	1.23–2.74*
Behavioral syndromes	1.96	1.58–2.43**	1.91	1.52–2.41**	1.97	1.48–2.62**	7.96	4.95–12.81**
Personality disorders	1.48	1.31–1.67**	1.36	1.19–1.55**	1.96	1.68–2.30**	2.46	1.64–3.70**
Mental retardation	3.25	2.44–4.33**	2.42	1.75–3.36**	4.68	3.38–6.48**	2.44	0.86–6.91
Developmental disorders	3.26	2.56–4.14**	2.87	2.21–3.72**	4.21	3.16–5.61**	4.04	1.92–8.49**
Attention-deficit hyperactivity disorders	1.38	1.12–1.70*	1.20	0.95–1.51	2.02	1.57–2.60**	3.33	1.86–5.94**
Other	1.96	1.67–2.29**	1.19	0.97–1.45	2.93	2.42–3.55**	6.97	4.59–10.59**
Self-harm								
No	1.00	Reference	1.00	Reference	1.00	Reference	1.00	Reference
Yes	1.42	1.12–1.80*	1.56	1.22–1.99**	1.25	0.96–1.63	2.22	1.55–3.18**
Admission type								
Planned	1.00	Reference	1.00	Reference	1.00	Reference	1.00	Reference
Acute	2.22	1.97–2.50**	2.46	2.14–2.82**	2.06	1.79–2.37**	1.23	0.98–1.56
Previous admissions								
0	1.00	Reference	1.00	Reference	1.00	Reference	1.00	Reference
1–5	0.51	0.48–0.54**	0.50	0.47–0.53**	0.69	0.64–0.74**	0.81	0.69–0.95*
At least 6	0.14	0.13–0.16**	0.15	0.14–0.17**	0.26	0.24–0.30**	0.38	0.30–0.47**
Parents' psychiatric history								
No	1.00	Reference	1.00	Reference	1.00	Reference	1.00	Reference
Yes	1.03	0.96–1.12	1.02	0.93–1.11	1.03	0.94–1.13	1.02	0.85–1.22
Outpatient treatment								
No	1.00	Reference	1.00	Reference	1.00	Reference	1.00	Reference
Yes	1.41	1.30–1.53**	1.32	1.20–1.45**	1.54	1.39–1.69**	1.73	1.44–2.07**

Fully adjusted model adjusted for sex, age, calendar period, parents' education, parents labor status, urbanity, psychiatric diagnosis, deliberate self-harm, admission type, previous admissions, parents' psychiatric history and outpatient treatment

OR odds ratio, *CA* compulsory admission

*$p < 0.05$, **$p < 0.001$

the basic adjusted analysis, we found no significant association between coercion and IQ, which might be because it is mainly mentally healthy men who attend conscription at the mandatory Armed Forces day.

Sociodemographic predictors

In concordance with previous studies, we found that male patients had a slightly higher risk of being subjected to coercion [5, 31]; however, not all prior studies find this association [2–4]. Unemployment was associated with any coercion in our study, which agrees with previous findings from Lay et al. [1] who showed associations between forced treatment and unemployment. Urbanicity had little impact on the results with a slightly decreased risk of any coercion and detainment in individuals living in provincial cities compared with those from rural areas and the capital. Husum et al. [4] found that higher levels of restraint were seen in wards located in urban areas; however, they included only involuntarily admitted patients [4]. In keeping with previous studies, our basic analyses showed that immigrants were more likely to be subjected to any coercive measure, [32, 33] albeit in the fully adjusted model we found an increased risk of coercion only in immigrants from low and middle income countries. We found an association between lower social class and coercive measures, [1] which is in agreement with some, but not all, other studies [30]. Social relations, such as being married and having children, decreased the likelihood of being coerced. This could be explained by patients with close social relations seeking treatment earlier, thereby preventing their illness markedly deteriorating. In a preventive perspective, patients with no social relations may benefit from new additional integrated mental health care approaches such as user involvement or assertive community treatment. Additionally, patient receiving early retirement had a reduced risk of being subjected to coercive measure, which could be explained by reduced level of stressors.

Strengths and limitations

Our study has several methodological advantages including a longitudinal design using population-based nationwide registers. All psychiatric inpatient facilities in Denmark are legally mandated to report every coercive measure. Patients subjected to coercion were counted only once in each analysis, avoiding any repeated registration of coercive measures. All psychiatric admissions in Denmark are free of charge and there are no private psychiatric inpatients facilities, ensuring that all psychiatric admissions are represented in the registers.

There are several limitations to the study. First, data on the use of coercive measures were not collected before 1999; accordingly, our data may not include the first time a patient is subjected to a coercive measure. Therefore, we made a sensitivity analyses on a younger cohort with full follow-up from adulthood. This analysis showed similar results. Second, we studied only time to first coercive measure in each of the four analyses; we could not examine deterioration of illness or any psychopathological rating scale data in the registers and its impact on coercion. Third, incomplete data forced us to include only grade, IQ and refugee variables in the basic adjusted model. Fourth, data did not include staff and ward related factors. Additionally, parents' education level and parents' labour market status were included only in the sensitivity- and basic analyses. Further, in Denmark when the psychiatric mental health act is used to apply any coercive measure in somatic hospitals, patients remain legally registered as psychiatric inpatients and contribute to the statistics of coercion in psychiatric hospitals. Although we included only psychiatric inpatients, the majority of patients treated for mental disorders in Denmark are treated as outpatients or by a general practitioner. Therefore, the proportion of all psychiatric patients subjected to any coercive measure is much lower than the 21.9% reported in our study, which is only the fraction among patients with more severe mental illness requiring psychiatric inpatient admission.

Conclusions

Utilizing nationwide register data, we identified a broad range of predictors of coercive measures, showing that organic mental disorder, mental retardation and schizophrenia are particular risk factors for coercion. Patients admitted for the first time had the highest risk of coercion, with decreasing risk with the number of hospital contacts. Our results indicate that closer contact with the mental health care services is a preventive factor for coercive measures. To prevent coercion, future research should focus on organizational factors facilitating user involvement and easier individualized access to the mental health care system. This cohort study contributes to the ongoing aim of reducing coercion to a minimum by helping researchers to identify risk factors of coercion.

Acknowledgements This work was supported by a grant from the Mental Health Centre, Frederiksberg. Thomsen received funding from the Danish Health Authority as a part of PhD training. The authors are grateful to the head of the Mental Health Centre, Frederiksberg, Dr. Kristen Kistrup for making the research possible. In

addition, we thank Dr. Holger Jelling Sørensen at the Mental Health Centre, Copenhagen, for his valuable advice.

Compliance with ethical standards

Ethical standards All personal information from the registers is anonymized when used for research purposes and the project was approved by the Danish Data Protection Agency, hence, according to Danish legislation, informed consent from participants was not required.

Conflict of interest The authors declare that they have no conflict of interest.

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