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## Use of the least intrusive coercion at Danish psychiatric wards

*A register-based cohort study of 131,632 first and subsequent coercive episodes within 35,812 admissions*

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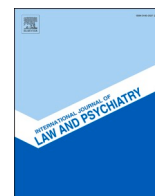
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## Use of the least intrusive coercion at Danish psychiatric wards: A register-based cohort study of 131,632 first and subsequent coercive episodes within 35,812 admissions

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## ABSTRACT

**Objective:** Psychiatric legislation in Denmark implies a principle of using the least intrusive types of coercion first. The intrusiveness is not universally agreed upon. We examined the order in which coercive measures during admission were used, implying that the first used should be less intrusive than the following types.

**Methods:** For coercive episodes reported to the national administrative register for the period 2011–16, the order of 12 legal coercive interventions during each admission was examined. Comparing with mechanical restraint, the odds ratio (OR) and confidence interval (95%CI) of being first or subsequent used types were estimated using conditioned (96,611 episodes) and unconditioned (131,632 episodes) logistic regression models, stratified on sex.

**Results:** Totally 17,796 patients aged 18+ were subjected to at least one coercive episode. The median time between admission and the first episode was 4 days in men and 6 for women. For females, involuntary detention, forced feeding, coercive treatment of somatic disorder, locking of doors and close observations in females were used before mechanical restraint, and forced follow-up, involuntary electro convulsive therapy (ECT), forced treatment, use of gloves and straps, physical restraint and forced intramuscular medication was used later. In men, only involuntary detention was used before mechanical restraint, while involuntary ECT, close observations, administration of drugs, use of gloves and straps, physical restraint and forced intramuscular medication was used after mechanical restraint.

**Conclusion:** The order of used coercive measures is not consistent with the international ranking of the least intrusive types, especially in men and in younger adults.

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## 1. Introduction

The interest for reducing the use of coercive measures such as restrictive interventions in psychiatry has been growing in Europe for several years (Kingdon, Jones, & Lönnqvist, 2004; National Institute for Health and Care Excellence, 2015; Parliamentary Assembly 2019), and it is a national target to reduce coercion in Denmark (Sundhedsstyrelsen, 2021). Restrictive interventions have been defined as: “deliberate acts on the part of other person(s) that restrict an individual’s movement, liberty and/or freedom to act independently in order to (...) take immediate control of a dangerous situation where there is a real possibility of harm to the person or others if no action is undertaken” (Duxbury & Jones, 2017). Such interventions include forced intramuscular (i. m.) medication, physical restraint, involuntary detention, and mechanical restraint and are only to be used as a last resort (Völlm & Nedopil, 2016). However, the prevalence of such interventions, for example mechanical restraint, varies to a great extent due to legal and cultural differences across Europe (Steinert & Lepping, 2009) and restrictive interventions are reportedly used very frequently and not always as a last resort (McLaughlin, Giacco, & Priebe, 2016; Raboch et al., 2010). When coercive measures are nevertheless considered necessary, the least restrictive measures are to be used to ensure as much respect for the patient’s autonomy as possible as well as the least possible amount of potential harm. The Council of Europe has stated that the rights of people with mental disorders include the usage of the least restrictive measure appropriate to the patient’s health and the protection of the safety of others (Kingdon et al., 2004).

Danish psychiatric legislation reflects this use of the “least intrusive remedy” (LIR) principle ((Sundheds- og Ældreministeriet, 2019); Sundhedsstyrelsen, 2009). The Act on Coercive Measures in Psychiatry (ACMP) (Sundheds- og Ældreministeriet, 2019) states that the application of a coercive measure should be proportional to the aim of that measure and that less intrusive measures should be applied if these are available (Para 4). There is, nonetheless, little guidance as to the precise contents of this principle, as ministerial orders (Sundheds- og Ældreministeriet, 2019a) merely refer to ACMP (Sundheds- og Ældreministeriet, 2019). Norway and Finland have similar legislative foundations or guidelines on using the least intrusive coercive measure as implied in the Danish legislation (Sundhedsstyrelsen, 2009).

The aim to use the least intrusive forms of coercive practices is widely acknowledged and different ranking systems and guidelines have been proposed (Kingdon et al., 2004; O’Brien & Golding, 2003). In an international survey among governmental authorities in 11 European countries, eight coercive measures were ranked according to their degree of intrusiveness from the perspective of the authority (Bak & Aggernæs, 2012; Sundhedsstyrelsen, 2009). All but two countries ranked “time out” and “constant [close] observation” as the least intrusive measures (Bak & Aggernæs, 2012; Sundhedsstyrelsen, 2009). There was less agreement regarding the ranking of most of the other measures, but six out of the 11 European countries ranked either mechanical restraint or ambulatory mechanical restraint as the most intrusive (Bak & Aggernæs, 2012; Sundhedsstyrelsen, 2009). The remaining international literature is scant (O’Brien & Golding, 2003) and do not offer a clear consensus on the ranking of intrusiveness.

As the authorities do not provide clear guidance to the use of the least intrusive measures for the clinicians using coercive measures, it will be up to the staff at the psychiatric wards to decide which measures to use first in clinical daily practice and by that their use will indirectly indicate their understanding of the LIR principle.

### 1.1. Aim of the study

We hypothesized that the interpretation of the LIR principle in clinical practice is reflected in the order of using coercive measures, so that the first applied measure for a patient during an admission would be regarded as less intrusive compared to the following measures and

describe the trajectories of coercive use.

## 2. Material and methods

### 2.1. Design

A register-based cohort study of patients aged 18 years or older who were subjected to at least one coercive measure during hospitalization in the period from 1 January 2011 to 31 December 2016 in Denmark.

### 2.2. Material

The Danish Register of Coercion in Psychiatry: All coercive episodes are notified to a national administrative register (“Register of Coercion in Psychiatry” [“Register over tvang i psykiatrien”], TIP) (Leerbeck, Mainz, & Bøggild, 2017; Sundheds- og Ældreministeriet 2019b), according to ACMP, paragraph 20 (Sundheds- og Ældreministeriet, 2019).

Data are entered directly from the wards no later than 10 days after the initiation of coercion, are updated regularly and at the end of the episode. Depending on the type of coercion, the record is collected in one of five different sub-registries reflecting the division in the ACMP and with the required registration defined in the Act (Sundheds- og Ældreministeriet, 2019).

Each record represents an episode of coercion for a specific patient identified using the unique personal identification number (CPR), which is assigned to all individuals in Denmark (Mainz, Hess, & Johnsen, 2019).

We obtained TIP records for the 6-year period 2011–2016, where legislation was only marginally changed, covering the following types of coercive measures: involuntary admission and detention (sub-register group 1), coercive treatment (sub-register group 2) and use of physical force (sub-register group 3). Altogether, we analysed 13 different types of coercive measures (see footnotes to Table 1 for a description of the individual types).

### 2.3. Methods

Records containing information on the same coercive episode, typically when updated in accordance with the Act, were identified by the personal identification number (CPR), type, day, and eventually time, and excess records were deleted, leaving only one record for each episode. The information from the three sub-registries was merged and for each admission, the type of coercion and date was retained. The time of day is only registered for group 3. The year of admission was divided into three periods, 2011–12, 2012–13 and 2014–15.

For each unique patient having at least one coercive episode during the six years, sex and age at the first episode was registered, and only patients with this information and being 18 or above was included (Fig. 1). Patients admitted to the National Maximum Security Ward were excluded. For one record, the time between admission and coercive episode was negative, suggesting a faulty registration. This record was deleted.

Within each admission, the sequence of coercive episodes was recorded. The first day with a coercive episode was marked and if more episodes were taking place on the same day, they were all regarded as happening at the same time (first), as the hour is not recorded for most types of coercion. All coercive measures within each admission were identified and divided into being either among the first or subsequent episodes. Time from admission to each episode was calculated.

Involuntary admission was included in the description of coercive episodes but was not included in the comparison between the first and subsequent episode, as it by definition will always be happening at admission and thus included in the first set of episodes.

**Table 1**

Distribution of coercive measures, 2011–2016.  $n = 153,197$  individual records, inclusive involuntary admissions (left), divided in first or subsequent episodes (right), excluding involuntary admissions,  $n = 131,632$ . Divided by sex. Number (column percentage).

	Total		Female			Male		All	
	Female	Male	All	First	Subsequent	First	Subsequent	First	Subsequent
Involuntary ECT (a)	390 (0.45)	238 (0.36)	628	108 (0.60)	282 (0.49)	62 (0.35)	176 (0.46)	170 (0.47)	458 (0.48)
Forced treatment (b)	2390 (2.76)	2444 (3.67)	4834	787 (4.34)	1603 (2.79)	931 (5.27)	1513 (3.94)	1718 (4.8)	3116 (3.25)
Forced feeding (c)	186 (0.21)	45 (0.07)	231	43 (0.24)	143 (0.25)	15 (0.08)	30 (0.08)	58 (0.16)	173 (0.18)
Coercive treatment of somatic disorder (d)	1451 (1.67)	1140 (1.71)	2591	574 (3.16)	877 (1.53)	448 (2.54)	692 (1.80)	1022 (2.85)	1569 (1.64)
Forced follow-up (e)	101 (0.12)	70 (0.11)	171	27 (0.15)	74 (0.13)	27 (0.15)	43 (0.11)	54 (0.15)	117 (0.12)
Gloves/straps (f)	9674 (11.16)	8364 (12.58)	18,038	31 (0.17)	9643 (16.79)	49 (0.28)	8315 (21.65)	80 (0.22)	17,958 (18.74)
Involuntary detention (g)	9198 (10.61)	8170 (12.28)	17,368	5261 (29.0)	3937 (6.86)	4813 (27.24)	3357 (8.74)	10,074 (28.13)	7294 (7.61)
Locking of doors (h)	2150 (2.48)	1566 (2.35)	3716	1192 (6.57)	958 (1.67)	986 (5.58)	580 (1.51)	2178 (6.08)	1538 (1.61)
Mechanical restraint (f)	16,073 (18.54)	12,811 (19.26)	28,884	4943 (27.25)	11,130 (19.38)	6679 (37.79)	6132 (15.97)	11,622 (32.45)	17,262 (18.02)
Close observations (i)	232 (0.27)	203 (0.31)	435	73 (0.40)	159 (0.28)	67 (0.38)	136 (0.35)	140 (0.39)	295 (0.31)
Physical restraint (j)	10,269 (11.85)	3508 (5.27)	13,777	2163 (11.92)	8106 (14.12)	1005 (5.69)	2503 (6.52)	3168 (8.85)	10,609 (11.07)
Forced intramuscular medication (k)	23,442 (27.04)	17,517 (26.34)	40,959	2938 (16.20)	20,504 (35.71)	2590 (14.66)	14,927 (38.87)	5528 (15.44)	35,431 (36.98)
Total (except involuntary admission)				18,140	57,416	17,672	38,404	35,812	95,820
involuntary admission (l)	11,137 (12.85)	10,428 (15.68)	21,565						
Total (including involuntary admission)	86,693	66,504	153,197						

ACMP: Act on coercive measures in psychiatry (Sundheds- og Ældreministeriet, 2019).

Types of coercive measures, translated from Danish with reference to the regulation, briefly explained.

a) Involuntary ECT (Electro Convulsive Therapy), use of ECT with force for certain psychotic conditions (ACMP, Para 12,3).

b) Forced treatment, use of tested drugs in usual dosage for psychiatric disorders with force (ACMP, Para 12,2).

c) Forced feeding (ACMP, Para 13), normally by forcefully inserted feeding tube.

d) Coercive treatment of somatic disorder, treatment by force of a somatic disorder that is a significant threat to the life or health of the patient (ACMP Para 13). The use requires that the patient is psychotic and at the same time both admitted and involuntary detained at a psychiatric hospital and admitted for somatic treatment (of for instance pneumonia or hip fracture) at a somatic ward.

e) Forced follow-up, order to appear in an outpatient clinic for medication, eventually with the help of the police (ACMP para 13d (now repealed (2019))), could be instituted if the patient was psychotic and had been involuntary admitted three times.

f) Mechanical restraint, Gloves/Straps, use of belt to fixate patients to bed, eventually further restraining movements of hands and feet by using straps and further restraining use of fingers by using gloves (ACMP, Para 14).

g) Involuntary detention, detaining after admission (ACMP, para 10), whether the patient had been voluntary or involuntary admitted, initiated if the patient request discharge and certain conditions are met.

h) Locking of doors, locking of doors at wards (not to patient rooms) (ACMP, Para 18f).

i) Close observations, a member of staff will constantly be near the patient, to be reported only if lasting >24 h (ACMP, Para 18d).

j) Physical restraint, use of retention and force to hold and move patients (ACMP, Para 17).

k) Forced intramuscular medication, acute administration of sedative drugs (ACMP, Para 17).

l) Involuntary admission, admission instituted by a physician outside the psychiatric hospital with the help of the Police (ACMP, Para 6) when certain conditions are met, to be approved by a psychiatrist.

#### 2.4. Statistical analysis

As the distribution of coercion differed by sex, all analyses are stratified by sex. Age and the time between admission and first episode of coercion was described by 25%, median and 75% quartiles. Age was divided in four age-groups (18–25; 25–40; 40–60 and 60+). The distribution of first and subsequent coercive episodes was described with the number and proportions of the distinct types. Odds ratio (OR) and 95% confidence intervals (95% CI) for the type of coercive measure used at the first episode compared with the type for subsequent episodes were estimated using logistic regression with the most intrusive type (mechanical restraint) as the reference. Thus, if a measure is used more often before the more intrusive type of mechanical restraint and thus implicitly less intrusive, its OR will be higher than 1. The use of gloves and straps is used in combination with mechanical restraint only and is probably regarded as more intrusive, but it was chosen to analyse this group by itself.

Two logistic regression models were used, one conditioned on admission and thus comparing the sequence of first and subsequent coercive measures within *each* admission, by that controlling for intra-individual differences like age, period and diagnoses (Fig. 1). As this however excluded all admissions with only first episodes, we also used

unconditioned logistic regression models comparing all first and all subsequent episodes, with adjustment of the period, as an alternative. These analyses were stratified by both sex and age group.

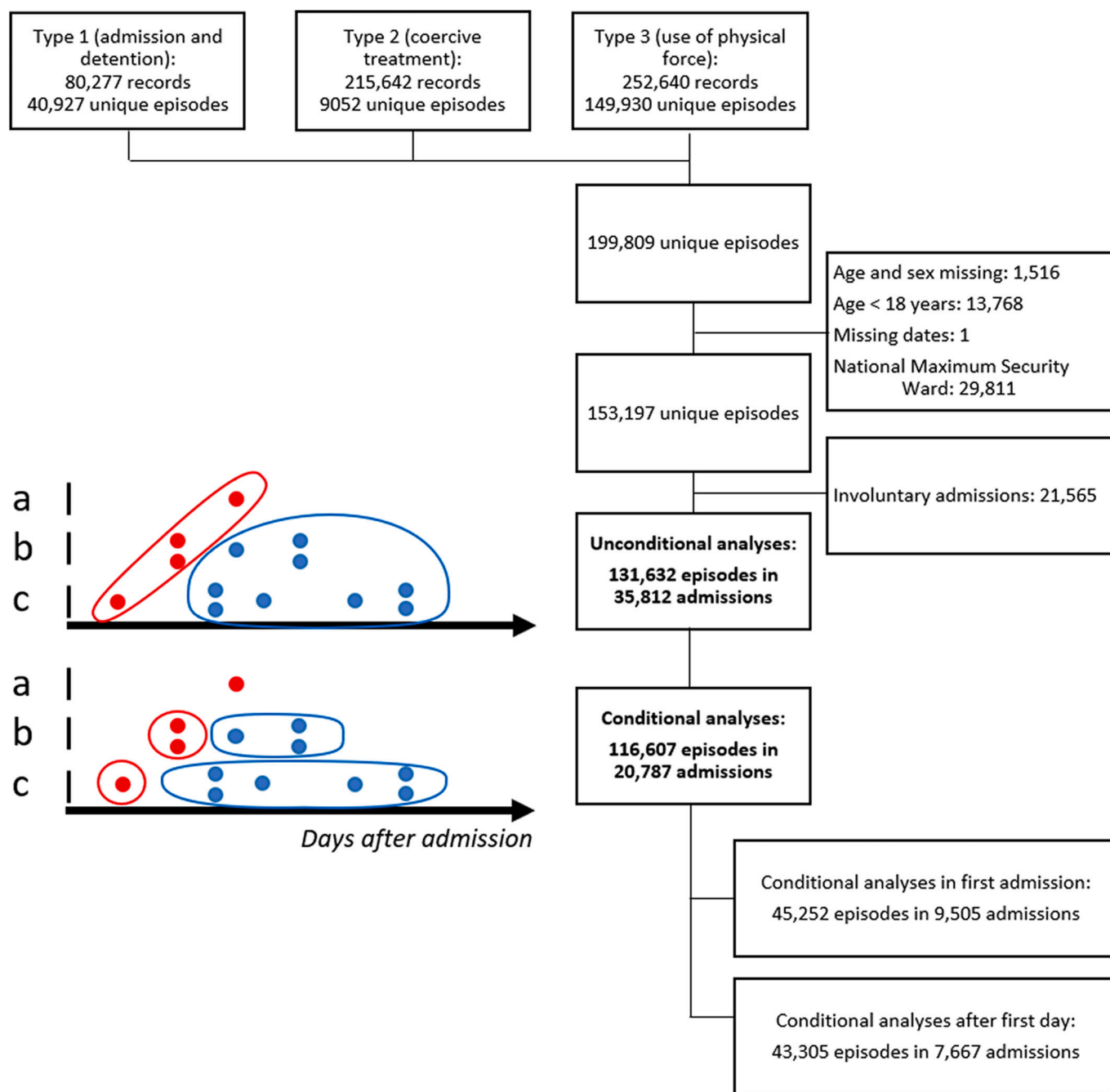
To examine whether previous knowledge of the patient could influence the choice of first coercive measures by the staff, we conducted supplementary analyses restricted to the first admission for each patient in the six-year period.

In another supplementary analysis, we restricted analyses by only including coercive episodes initiated after the first 24 h of admission to exclude initiation of restraint in the immediate relation to the potential acute admission of the patient. Both supplementary analyses were conducted in the conditional regression models.

Interaction between type of coercion and period and between type of coercion and age group was evaluated in the unconditioned models by including an interaction term in the final model and examining whether the term was statistically significant.

Data were managed and analysed using SAS v 9.4 (Cary, NC, USA) and the R statistical program, version 4.1.0 (R Core Team, 2021).

The study was approved by the Danish Data Protection Agency (2013-41-2503). Use of administrative register data for research does not require ethical approval according to Danish legislation.



**Fig. 1.** Coercive episodes, 2011–2016, group 1–3, in Danish psychiatric hospitals. The insert at left shows the principles for analyses of first (red) and subsequent (blue) episodes in each admission (a, b and c), starting at the black mark at left. Each dot is a coercive episode. In the top figure unconditional logistic regression (comparing all first and all subsequent episodes regardless of admission) and at bottom the conditional analyses comparing first and subsequent episodes within each admission. In the conditional regression analysis (bottom) the episode in admission a) will not be included in the analysis as it only consists of one or more first episodes. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

### 3. Results

The distribution of coercive measure types is shown in Table 1 (including involuntary admission), stratified by sex. Females were, in general, more often subjected to physical restraint and forced intramuscular medication, while men were more often subjected to involuntary admission, detention, forced treatment and mechanical restraint. The distribution of coercive measures by sex was statistically significant (chi-square 2363.27 (df = 12),  $p < 0.0001$ ) and regression analyses were therefore stratified by sex.

The 153,197 episodes (including involuntary admission) were

recorded among 17,796 unique patients, 9641 males (54.4%) aged (median (q1- q3)) 44 (30–58) years and 8155 females aged 48 (32–64) years. Most patients had only one admission in the period, but some had >50 admissions. The number of coercive episodes across all admissions was median 3 (2–7) for both sexes. Few patients had several hundred episodes during the six years.

The median time (q1-q3) between admission and the first coercive episode was 4 days (0–18) for men and 6 (1–27) for females.

The distribution of first and subsequent episodes by coercive type is also shown in Table 1, right part. Apart for involuntary detention, mechanical restraint was the most frequently used first choice of coercion

type among women and the most often used in men, comprising more than 1/3 of all first episodes. Forced intramuscular medication was the most used coercive type in the subsequent group in both men and women. The use of gloves and straps were seldom used as the first type.

In Fig. 2, the results for the conditional logistic regression models are shown, stratified by sex. Mechanical restraint, regarded as the most intrusive coercive type, was used as the reference, so an OR higher than one for a coercive type mean that this was used as the first coercive type more often than mechanical restraint and values lower than one, that the type was more often used subsequently, compared with mechanical restraint. For both men and women, involuntary detention was more often used as the first type, in females also forced feeding and coercive treatment of somatic disorder, locking of doors and close observations were more often used among the first episodes than mechanical restraint. Among men, locking of doors, coercive treatment of somatic disorder and forced feeding were not statistically significantly different from mechanical restraint, while all other types (involuntary ECT, forced treatment, use of gloves/straps, close observations, physical

restraint and forced intramuscular medication) were used less often among the first episodes compared with mechanical restraint.

In Table 2 the results of unconditional regression models are described to also include those admissions with only first episodes. Interaction was found for age group, while no interaction was found between type of coercion and period in neither sex. Results were thus stratified for sex and age group, and further adjusted for period.

In these analyses, involuntary detention and locking of doors were used more often as the first types compared with mechanical restraint, and physical restraint, use of gloves/straps and forced intramuscular medications were used less often as the first episodes in both sexes and all age groups.

In females, coercive treatment of somatic disease was used more often as a first coercive measure in the oldest age group, and involuntary ECT and forced treatment more often subsequent for the middle-aged groups. In men, involuntary ECT was also used subsequently to mechanical restraint in the middle-aged groups, while forced treatment, coercive treatment of somatic disorders and close observations were all

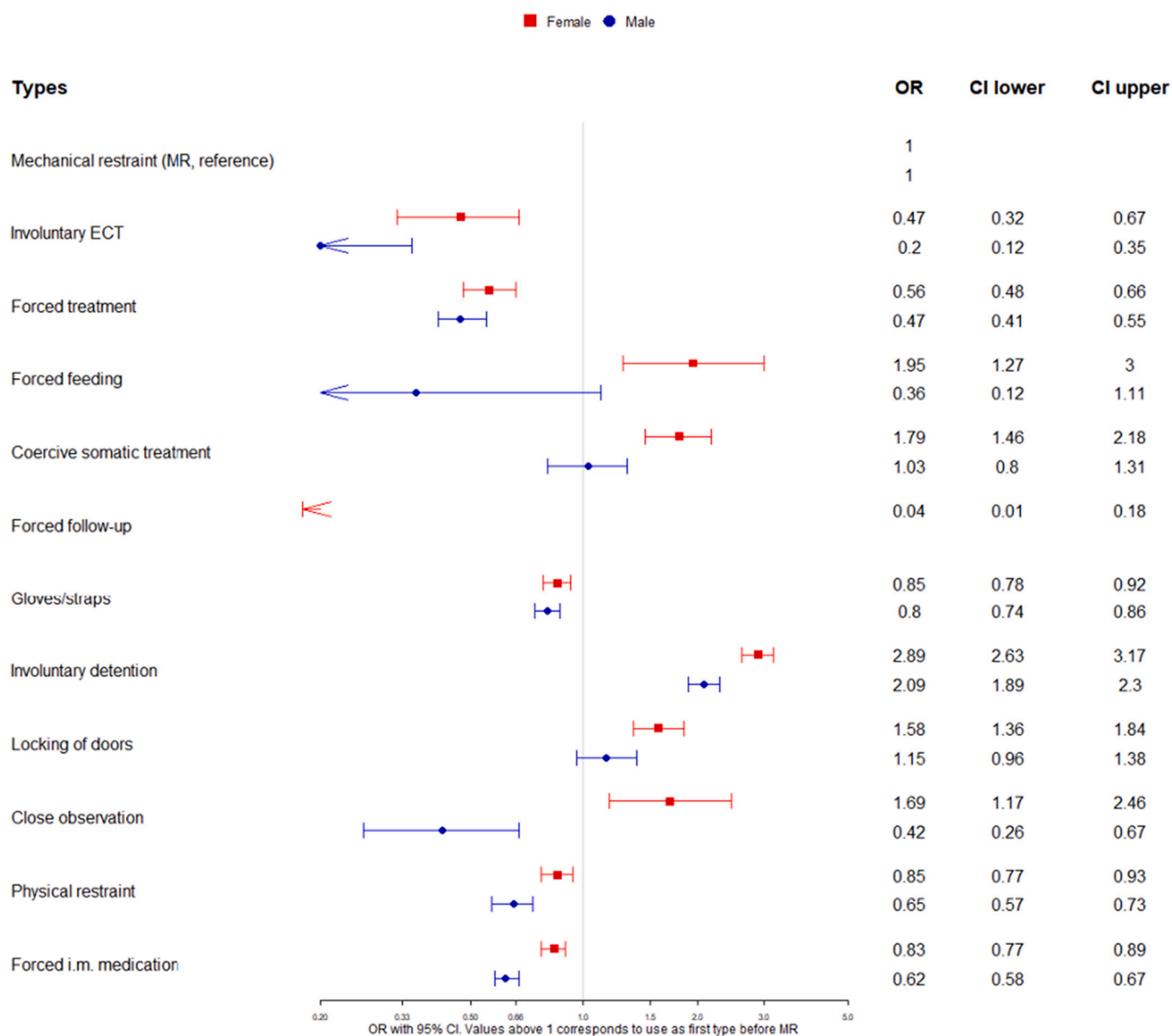


Fig. 2. Association (Odds Ratio (OR) and 95% Confidence Interval (CI) for first versus subsequent coercive episodes, each coercive type compared with mechanical restraint (MR, reference), stratified by sex. Results of conditional logistic regression.

**Table 2**

Association (OR and 95% CI) for first versus subsequent coercive episodes, each coercive type compared with mechanical restraint (reference). All episodes, unadjusted logistic regression. Stratified by sex and age group, adjusted for period. Estimates in *italic* are statistically significant below 1 and used after mechanical restraint. **Bold** figures are statistically significant above 1 and used before mechanical restraint.

Age group	18–25		25–40		40–60		60–					
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI		
<b>Female</b>												
Mechanical restraint (f)	1	(ref)	1	(ref)	1	(ref)	1	(ref)	1	(ref)		
Involuntary ECT (a)	0.17	0.02	1.29	<i>0.46</i>	<i>0.21</i>	<i>0.97</i>	<i>0.41</i>	<i>0.27</i>	<i>0.64</i>	0.88	0.64	1.20
Forced treatment (b)	0.74	0.54	1.03	<i>0.74</i>	<i>0.59</i>	<i>0.93</i>	<i>0.69</i>	<i>0.59</i>	<i>0.80</i>	1.17	0.96	1.41
Forced feeding (c)	0.94	0.60	1.49	0.56	0.26	1.21	0.43	0.14	1.30	0.49	0.19	1.25
Coercive treatment of somatic disorder (d)	1.10	0.88	1.39	1.18	0.92	1.52	0.93	0.74	1.17	<b>1.79</b>	<b>1.43</b>	<b>2.25</b>
Forced follow-up (e)	3.17	0.20	50.73	1.78	0.57	5.64	<i>0.46</i>	<i>0.24</i>	<i>0.89</i>	0.47	0.22	1.01
Gloves/straps (f)	<i>0.00</i>	<i>0.00</i>	<i>0.01</i>	<i>0.01</i>	<i>0.01</i>	<i>0.02</i>	<i>0.01</i>	<i>0.00</i>	<i>0.01</i>	<i>0.01</i>	<i>0.00</i>	<i>0.03</i>
Involuntary detention (g)	<b>2.39</b>	<b>2.15</b>	<b>2.66</b>	<b>3.19</b>	<b>2.89</b>	<b>3.51</b>	<b>2.15</b>	<b>1.94</b>	<b>2.38</b>	<b>3.04</b>	<b>2.59</b>	<b>3.56</b>
Locking of doors (h)	<b>2.74</b>	<b>2.28</b>	<b>3.30</b>	<b>3.15</b>	<b>2.64</b>	<b>3.74</b>	<b>1.77</b>	<b>1.49</b>	<b>2.10</b>	<b>2.58</b>	<b>2.05</b>	<b>3.24</b>
Close observations (i)	1.52	0.93	2.49	1.16	0.70	1.93	0.82	0.49	1.36	0.18	0.06	0.61
Physical restraint (j)	<i>0.58</i>	<i>0.52</i>	<i>0.64</i>	<i>0.61</i>	<i>0.54</i>	<i>0.68</i>	<i>0.44</i>	<i>0.39</i>	<i>0.49</i>	<i>0.70</i>	<i>0.59</i>	<i>0.83</i>
Forced intramuscular medication (k)	<i>0.19</i>	<i>0.17</i>	<i>0.21</i>	<i>0.27</i>	<i>0.24</i>	<i>0.30</i>	<i>0.28</i>	<i>0.26</i>	<i>0.31</i>	<i>0.37</i>	<i>0.32</i>	<i>0.43</i>
<b>Male</b>												
Mechanical restraint (f)	1	(ref)	1	(ref)	1	(ref)	1	(ref)	1	(ref)		
Involuntary ECT (a)	n.a.			<i>0.10</i>	<i>0.03</i>	<i>0.31</i>	<i>0.12</i>	<i>0.06</i>	<i>0.23</i>	0.89	0.60	1.32
Forced treatment (b)	<i>0.41</i>	<i>0.32</i>	<i>0.53</i>	<i>0.51</i>	<i>0.43</i>	<i>0.60</i>	<i>0.54</i>	<i>0.47</i>	<i>0.62</i>	0.84	0.69	1.02
Forced feeding (c)	n.a.			n.a.			0.51	0.19	1.41	0.68	0.30	1.59
Coercive treatment of somatic disorder (d)	<i>0.43</i>	<i>0.27</i>	<i>0.68</i>	<i>0.35</i>	<i>0.25</i>	<i>0.49</i>	<i>0.53</i>	<i>0.43</i>	<i>0.66</i>	0.88	0.72	1.07
Forced follow-up (e)	0.91	0.06	14.59	0.31	0.08	1.14	0.79	0.38	1.64	0.52	0.23	1.17
Gloves/straps (f)	<i>0.01</i>	<i>0.00</i>	<i>0.01</i>	<i>0.00</i>	<i>0.00</i>	<i>0.01</i>	<i>0.00</i>	<i>0.00</i>	<i>0.01</i>	<i>0.01</i>	<i>0.01</i>	<i>0.03</i>
Involuntary detention (g)	<b>1.22</b>	<b>1.07</b>	<b>1.38</b>	<b>1.43</b>	<b>1.30</b>	<b>1.59</b>	<b>1.21</b>	<b>1.10</b>	<b>1.33</b>	<b>1.48</b>	<b>1.29</b>	<b>1.71</b>
Locking of doors (h)	<b>1.35</b>	<b>1.04</b>	<b>1.74</b>	<b>2.16</b>	<b>1.74</b>	<b>2.68</b>	<b>1.37</b>	<b>1.13</b>	<b>1.66</b>	<b>1.58</b>	<b>1.26</b>	<b>1.97</b>
Close observations (i)	<i>0.46</i>	<i>0.25</i>	<i>0.86</i>	<i>0.60</i>	<i>0.39</i>	<i>0.94</i>	<i>0.23</i>	<i>0.12</i>	<i>0.43</i>	0.92	0.33	2.55
Physical restraint (j)	<i>0.30</i>	<i>0.24</i>	<i>0.37</i>	<i>0.43</i>	<i>0.36</i>	<i>0.51</i>	<i>0.40</i>	<i>0.34</i>	<i>0.46</i>	<i>0.37</i>	<i>0.32</i>	<i>0.44</i>
Forced intramuscular medication (k)	<i>0.15</i>	<i>0.13</i>	<i>0.17</i>	<i>0.15</i>	<i>0.14</i>	<i>0.17</i>	<i>0.14</i>	<i>0.13</i>	<i>0.16</i>	<i>0.23</i>	<i>0.20</i>	<i>0.26</i>

n.a.: not analysed due to cells with zero.

footnote a-i: please find explanations below [Table 1](#).

used more often as a subsequent measure in all but the oldest age groups.

[Table 3](#) shows conditional analysis restricted to the first admission only to examine whether previous experience and knowledge of the patient could influence the choice of the first coercive type. The same pattern as for all admissions was seen, with involuntary detention being used before mechanical restraint, for women locking of doors was also used as the first type. The rest was either non-significantly differently from mechanical restraint or used later, especially physical restraint and forced intramuscular medication.

Also in [Table 3](#), results of analysis restricted to day 2 of admission and later is shown, conducted to examine whether the first day of admission was special. In women, the same pattern as in [Fig. 2](#) was seen, except that physical restraint was used before mechanical restraint. For involuntary detention, forced feeding, locking of doors and close observations the results were similar, the estimates for involuntary ECT and forced treatment were no longer statistically significant, but in the same magnitude and direction. In men, only involuntary detention and locking of doors were used before mechanical restraint, while coercive treatment of somatic disorder, using close observations and forced intramuscular medication was used after mechanical restraint. Involuntary ECT, forced treatment and physical restraint were non-significant, but in the same direction as in the non-restricted analyses.

#### 4. Discussion

The main idea of our analyses was that less intrusive measures should be put into use before more intrusive ones and that the sequence would represent the underlying LIR concept as used by clinicians. Identifying mechanical restraint (and the use of gloves and straps) in literature as the most intrusive ([Bak & Aggernæs, 2012](#)), this should be used late, and by using it as the reference, OR of the less intrusive types will be higher than 1 when comparing the odds of being used among the first types. In this national register-based study of 131,632 coercive measures used during the period 2011–2016, coercion use patterns suggest some

measures being preferred to others as the ‘first choice’. Involuntary detention, coercive somatic treatment, forced feeding and locking of doors were used before mechanical restraint, mostly so in women, physical restraint, forced medication, forced treatment and involuntary ECT was statistically significantly more often used later than mechanical restraint. This hierarchy in many aspects resembles the tentative ranking of measures proposed in previous reports ([Bak & Aggernæs, 2012](#)). The use of gloves and straps together with mechanical restraint is initiated later than mechanical restraint alone, which is also following this principle, and forced follow-up is used later, as it by definition in the ACMP could only be launched after three involuntary admissions. However, most of the results are not in accordance with the LIR concept in literature; physical restraint and use of forced intramuscular medication, which seems in literature to be regarded as less intrusive than mechanical restraint ([Bak & Aggernæs, 2012](#)), are used less often as the first, also when restricting analyses to the later part of the admissions. This suggests that these measures are either not regarded as less intrusive at the psychiatric wards or that they are for other reasons not available to be used when the situation occurs.

The 12 types of coercive measures analysed are used in different situations and they are not completely interchangeable. Some types of coercion are used only in special situations, e.g., ECT for depression with psychosis, coercive treatment of somatic disorders and forced nutrition for severe eating disorder, and they are not directly interchangeable. Other types, forced treatment for instance, are used later in admissions than mechanical restraint, and this could be due to the requirement to initiate these types of coercion only after lengthy attempts to persuade for voluntary treatment and deciding the use at a clinical conference. The patient can complain over the decision of initiating forced treatment and delay the implementation until the assessment of the complaint has been made. Nonetheless, forced ECT is used later in the admission than mechanical restraint in both sexes, while nutrition is used before mechanical restraint in females only, suggesting that forced feeding is regarded as less intrusive in this group. Forced treatment may be

**Table 3**

Association (OR and 95% CI) for first versus subsequent coercive episodes, each coercive type compared with mechanical restraint (reference), stratified by sex. Results of conditional logistic regression. Analyses restricted to only the first admission (top) or to the 2. day of admission or later (bottom), all admissions. Estimates in italic are statistically significant below 1 and used after mechanical restraint. Bold figures are statistically significant above 1 and used before mechanical restraint.

Restricted to the first admission in the period	Female			Male		
	OR	95% CI		OR	95% CI	
Mechanical restraint (f)	1	(ref)		1	(ref)	
Involuntary ECT (a)	<i>0.42</i>	<i>0.25</i>	<i>0.70</i>	<i>0.19</i>	<i>0.09</i>	<i>0.42</i>
Forced treatment (b)	<i>0.52</i>	<i>0.41</i>	<i>0.66</i>	<i>0.45</i>	<i>0.36</i>	<i>0.57</i>
Forced feeding (c)	1.50	0.80	2.83	0.54	0.14	2.13
Coercive treatment of somatic disorder (d)	1.16	0.83	1.63	1.35	0.98	1.87
Forced follow-up (e)	n.a	n.a	n.a	n.a	n.a	n.a
Gloves/straps (f)	<i>0.83</i>	<i>0.70</i>	<i>0.99</i>	<i>0.76</i>	<i>0.67</i>	<i>0.85</i>
Involuntary detention (g)	<b>2.35</b>	<b>2.01</b>	<b>2.74</b>	<b>1.84</b>	<b>1.60</b>	<b>2.10</b>
Locking of doors (h)	<b>1.28</b>	<b>1.02</b>	<b>1.61</b>	<b>1.06</b>	<b>0.83</b>	<b>1.36</b>
Close observations (i)	1.54	0.81	2.93	0.52	0.26	1.05
Physical restraint (j)	<i>0.78</i>	<i>0.67</i>	<i>0.92</i>	<i>0.64</i>	<i>0.53</i>	<i>0.78</i>
Forced intramuscular medication (k)	<i>0.83</i>	<i>0.73</i>	<i>0.94</i>	<i>0.65</i>	<i>0.59</i>	<i>0.72</i>
Restricted to 2. day of admission and later	Female			Male		
	OR	95% CI		OR	95% CI	
Mechanical restraint (f)	1	(ref)		1	(ref)	
Involuntary ECT (a)	0.65	0.41	1.03	0.54	0.29	1.01
Forced treatment (b)	1.16	0.94	1.44	0.94	0.78	1.14
Forced feeding (c)	<b>2.19</b>	<b>1.11</b>	<b>4.32</b>	n.a	n.a	n.a
Coercive treatment of somatic disorder (d)	1.01	0.65	1.57	<i>0.54</i>	<i>0.31</i>	<i>0.95</i>
Forced follow-up (e)	n.a	n.a	n.a	n.a	n.a	n.a
Gloves/straps (f)	<i>0.81</i>	<i>0.69</i>	<i>0.97</i>	<i>0.84</i>	<i>0.74</i>	<i>0.96</i>
Involuntary detention (g)	<b>2.81</b>	<b>2.40</b>	<b>3.28</b>	<b>2.06</b>	<b>1.77</b>	<b>2.39</b>
Locking of doors (h)	<b>1.65</b>	<b>1.29</b>	<b>2.10</b>	<b>1.65</b>	<b>1.25</b>	<b>2.17</b>
Close observations (i)	<b>2.82</b>	<b>1.70</b>	<b>4.67</b>	<i>0.51</i>	<i>0.29</i>	<i>0.89</i>
Physical restraint (j)	<b>1.23</b>	<b>1.06</b>	<b>1.44</b>	0.89	0.74	1.07
Forced intramuscular medication (k)	1.12	0.98	1.28	<i>0.81</i>	<i>0.73</i>	<i>0.92</i>

n.a.: not analysed due to cells with zero.

footnote a-k: please find explanations below Table 1.

regarded as less intrusive than mechanical restraint (Bak & Aggernæs, 2012) and yet is used later, by that suggesting that it would be relevant to consider relaxing the legal requirements of this coercive measure to help initiate it before mechanical restraint, if regarded as less intrusive by the authorities.

The distribution of coercive measures is different between sexes and suggests that although all types of coercion are used among both men and women, coercion in general is initiated two days earlier among men than women, and the more intrusive types are introduced among the first in men. Male sex has previously been reported as a risk factor for being subjected to coercion in some (Knutzen et al., 2011; Thomsen et al., 2017) but not all studies (Keski-Valkama et al., 2010). Especially when restricting to the second day of admission and later (Table 3), the pattern in females is reflecting use in accordance with the LIR principles outlined in literature, with only gloves and straps used later than mechanical restraint. For men, however, the pattern is mimicking the main analysis. The stratification on age (Table 2) shows that the order of different types of coercion are different in especially the oldest age group, but still with a late use of close observations, physical restraint and forced i.m. medication compared with mechanical restraint.

The official regulation upholds the LIR principles (e.g. Paras 4 and 10) (Birkeland & Gildberg, 2016; Sundheds- og Ældreministeriet, 2019), but there is relatively little guidance bringing these requirements into practice. The Ministerial Order (Sundheds- og Ældreministeriet, 2019a)

merely refer to para 4 and states: “[...] Are less intrusive measures sufficient, these should be applied” (Para 4, section 2) (Sundheds- og Ældreministeriet, 2019), but by this not offering guidance as to which measures are less intrusive.

The scant existing literature suggests that patients perceive coercive measures individually and differently (Brady, Spittal, Brophy, & Harvey, 2017; Georgieva, Mulder, & Wierdsma, 2012; Hui, 2017; Tingleff, Bradley, Gildberg, Munksgaard, & Hounsgaard, 2017), and that the use of e.g. physical restraint or mechanical restraint may for some patients be experienced as feeling safe and cared for, for others attached to feeling of punishment, fear and anxiety, and with loss of control and dignity.

In August 2020 the ministerial guidance (Sundhedsstyrelsen, 2020) on the LIR-principles was revised and now suggests that patients should be consulted as to which coercive treatment they would prefer if the application should be considered necessary at some point during treatment and by that including the patient's own individual view. This, however, does not address the many situations in which the patients are not able to declare what they would prefer in the situation or when the patients have never experienced coercion and therefore cannot let personal experience guide their decision.

Thus, in the absence of formal guidance on the implementation of the LIR principles, psychiatric staff members must themselves assess what is regarded as the least intrusive coercive measure (Molewijk, Kok, Husum, Pedersen, & Aasland, 2017). What governs the choices of staff member in the actual situation is not known, but experiences of being subjected to violence and ward culture may influence the choices of coercive type (Husum, Bjørngaard, Finset, & Ruud, 2011; Molewijk et al., 2017). Organizational discussion and leadership directions might be needed, as well as training, situation planning, formal debriefing and evaluation at ward level with the aim of explore the timing of different coercive types and potentially change this toward the use of less intrusive types.

#### 4.1. Strengths and weaknesses

There is no generally accepted ranking of the intrusiveness of the 12 coercive measures analysed, and although it is widely acknowledged that some measures are more intrusive than others, patients may perceive the intrusiveness of measures different from, e.g., clinicians. The choice of using mechanical restraint as the reference group was based on the focus of Danish authorities to reduce especially this type of coercion (Sundhedsstyrelsen, 2021), but it could be debated. As the use of a reference is relative, it is however possible to also evaluate the first and subsequent use relative to other measures.

Counting the number of episodes is partly misleading as registration rules are different, so for example use of mechanical restraint is registered every time the belt is applied, while coercive treatment is registered only once when decided, regardless of the number of times the medication is given using force. Since both are registered the first time they are used, however, the regression analyses in this study will be unaffected by this difference.

Some episodes may be closely related, for instance, administration of sedatives to a patient who has just been mechanically restrained, and this may suggest that the order of registration could be registered randomly at the wards. This was handled by examining all coercive measures happening on the same day together.

The analysis comprises only of the types of coercion recorded in the administrative groups 1–3, not including group 4 and 5, as the conditions for their use differ considerably. Coercive measures in group 4 are used for patients with dementia and are mostly used in gerontopsychiatric wards and not in general psychiatry. Group 5 are coercive measures used only at the National Maximum Security Ward, where relatively few patients are detained for longer periods in special situations. The episodes related to group 1–3 are also deleted for this group. The number of first episodes are few and would not have changed the



results.

Data in the TIP are collected for administrative purposes and might be subject to error. On the other hand, as the register covers the target population, the risk of selection bias is negligible. We also have analysed all episodes for a 5-year period in the unconditional analysis.

Some episodes of coercion may not have been registered, but this would only lead to bias in our study if any lacking episodes were related to being either the first or subsequent day, which seems implausible. Protocols might be skipped on busy shifts, but they would probably be registered within the 10-day period granted for registration.

The analyses were conducted on each admission, allowing the same patient to be included more than once. This would potentially break the independence between admissions, for instance, if patients were known to become violent and thus leading staff members to use for instance mechanical restraint from the beginning. We analysed this in a sensitivity analysis (Table 3), finding the same results and thus suggesting that this was not the reason for the results.

The use of gloves and straps require the use of a belt and are by that a subset of the mechanical restraint group, but we chose to analyse the group by itself, as it behaves very differently. It would seem to be more restrictive, and the analyses underpin this evaluation. We excluded involuntary admission as this is by definition initiated before admission, likewise involuntary detention will often be initiated within the first days of admission, but it is formally not necessary to have initiated involuntary detention before instituting other coercive measures, and we thus included this type of coercion in the analyses.

Finally, the psychiatric diagnosis itself influences the use of coercion, as patients with, e.g., schizophrenia are more often subjected to coercion (Thomsen et al., 2017) and diagnosis could thus be related to the ordering. For the analyses conducted as conditional regression within admissions, these differences are handled, as the patient is acting as its own control.

The ACMP defines the allowed types of coercion and in the period 2011–16 only minor changes were implemented leaving a stable set of coercive measures that could be used according to law. We chose the starting point 2011 as the ACMP amendment Act 533 dated 26/05/2010 implemented the use of forced follow-up coming into force on October 1st, 2010 and was effective throughout the study period.

## 5. Conclusions

In summary, to a certain degree, the measures that in the literature are regarded as being the least intrusive are used first, as locking of doors and close observations in females are used before mechanical restraint and use of gloves and straps are launched after mechanical restraint. But other measures that are in general evaluated as less intrusive than mechanical restraint, such as close observations, physical restraint and forced intramuscular medication, are used less frequently as the first coercive measure compared with mechanical restraint, although they are also allowed to be used in acute situations. This is especially apparent for men and for the younger patients.

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## Data availability statement

To protect patient privacy, the data used in this study is only available through Statistics Denmark, which stores the data. Danish research organisations can be authorized to work with data within Statistics Denmark and gain access to individual, but pseudonymized, data. Data are available upon request to authorized scientists through Statistics Denmark. Information regarding possibilities for data access is available at <https://www.dst.dk/en/TilSalg/Forskningservice>.

## Declaration of interests

None.

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