

Use of coercion at Danish psychiatric wards by day of week and time of day

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ABSTRACT

INTRODUCTION: Mechanical restraint and other forms of coercion may be used under certain circumstances at psychiatric wards. The use of coercion receives considerable focus, yet little is known about its diurnal distribution. We examined the initiation of mechanical restraint, sedative drug administration, physical retention, door locking and personal shielding by time of day and week.

METHODS: Group 3 protocols in the national Register of Coercion for patients aged ≥ 18 years in the years 2010-2012 were analysed. The first coercive episode was internally compared with respect to type, shift and whether it had been initiated on weekdays or weekend days. The odds ratio for experiencing coercive episodes outside day shifts on weekdays was calculated, and adjusted for sex, age and hospital. Episodes initiated after 24 hours of admission were also analysed.

RESULTS: The dataset consisted of 68,619 records from 7,338 persons. The first coercive episode was mostly initiated during a day shift on a weekday (44.9%), but this differed markedly between types of coercion. Compared with locking of doors, the adjusted odds ratio of being subjected to coercion outside the day shift on weekdays was 3.32 (95% confidence interval (CI): 2.91-3.79) for mechanical restraint and 2.70 (95% CI: 2.32-3.16) for physical retention. This pattern persisted if the first episode was initiated at least 24 hours after admission.

CONCLUSIONS: The initiation of coercion was lower during evenings, nights and weekends, but different coercive types and hospitals follow different diurnal patterns, which indicates unexplained variations.

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In the Danish psychiatric hospital system, which is entirely publicly funded, the use of coercion is subject to intense political focus [1], although coercion is used for the protection and care of the patient. One in five patients at psychiatric hospitals is subjected to coercion, and the use of coercion has been rising over the years [2].

The use of coercion is based on the Mental Health Act (MHA) [3-5], which clearly describes the indications and conditions for use of coercion.

Coercive measures are divided into five main groups: 1) compulsory admission and detention by force, 2) involuntary treatments (i.e. without the patient's consent), 3) physical restraint (belt fixation possibly combined with the use of straps or gloves, involuntary sedative drug administration, physical retention, locking of doors, and personal shielding), 4) protective precautions (fabric belt, personal alarm, etc., primarily used for patients with dementia) and 5) specific measures used at the National Department of Maximum Security ("Sikringen") in Region Zealand.

Coercion can be used only when no other treatment is available and after trying to obtain the patient's voluntary participation. The least intrusive coercive measure is always the first choice [3]. Group 3 coercive measures are summarized in the footnote to **Table 1** [6].

Studies [7-11] have found an association between the number of staff members per patient and the use of physical restraints or seclusion, but the use of physical restraints (Group 3) in relation to time of day and week has not previously been described in Denmark.

METHODS

Design

This was a register-based, cross-sectional study of patients aged ≥ 18 years who had been subjected to Group 3 coercive measures in the period from 1 January 2010 to 31 December 2012 in Denmark.

Material

In Denmark, all coercive episodes are notified to a national register ("Register over tvang i psykiatrien", TIP). Data are entered directly from the wards no later than ten days after the initiation of coercion and are updated at the end of the episode.

Each record represents a protocol for an episode of coercion for a specific patient identified using the unique personal identification number (CPR), which is assigned to all individuals in Denmark. The psychiatric hospital unit, dates of admission and discharge, dates and time of the beginning and ending of the coercive episode are registered.

We obtained Group 3 TIP records from for a three-year period with extracted information on sex and age from the CPR, but replaced such information with a

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TABLE 1

Distribution of first episode of specific types of coercion, Group 3, in any hospitalization, 2010-2012, by type of day and shift. The values are n.

	Physical retention ^a	Locking of doors ^b	Sedative drug administration ^c	Personal shielding ^d	Mechanical restraint w/o straps, gloves ^e	Total
<i>Weekday</i>						
Day shift	548	690	1,369	59	1,468	4,134
Evening shift	599	340	850	19	1,696	3,504
Night shift	229	30	450	8	854	1,571
Subtotal	1,376	1,060	2,669	86	4,018	9,209
<i>Weekend</i>						
Day shift	164	131	347	22	397	1,061
Evening shift	234	89	334	4	615	1,276
Night shift	101	9	188	3	436	737
Subtotal	499	229	869	29	1,448	3,074
<i>Total</i>						
Day shift	712	821	1,716	81	1,865	5,195
Evening shift	833	429	1,184	23	2,311	4,780
Night shift	330	39	638	11	1,290	2,308
Total	1,875	1,289	3,538	115	5,466	12,283

MHA = Mental Health Act; w/o = with or without.

a) "Fastholdelse og brug af fysisk magt" translated from Danish language: use of retention and force to hold and move patients (MHA, Section 17).

b) "Aflåsning af døre" translated from Danish language: locking of doors at wards (not to patient rooms) (MHA, Section 18f).

c) "Indgivelse af beroligende lægemiddel" translated from Danish language: administration of sedative drugs by force (MHA, Section 17).

d) "Personlig skærmning" translated from Danish language: a member of staff will constantly be near the patient, to be reported if lasting > 24 h (MHA, Section 18d).

e) "Tvangsfiksering med bælte, med hånd- eller fodremme, med handsker" translated from Danish language: use of belt to fixate patients to bed, further restraining movements of hands and feet by using straps, further restraining use of fingers by using gloves (MHA, Section 14). As the use of hand and foot straps and gloves require mechanical restraint with belt, these are pooled together in 1 group.

TABLE 2

Distribution of first episode of coercion, Group 3, on type of day and shift in any hospitalization, 2010-2012***. The values are n (%).

Type of shift	Type of day		Total
	weekday	weekend	
Day shift	4,134 (44.9)	1,061 (34.5)	5,195 (42.3)
Evening shift	3,504 (38.0)	1,276 (41.5)	4,780 (38.9)
Night shift	1,571 (17.1)	737 (24.0)	2,308 (18.8)
Total	9,209	3,074	12,283

***) Pearson's chi-square 124.016, p-value < 0.000.

pseudo ID-number for identification of protocols belonging to the same patient while maintaining the patient's anonymity.

Coercive protocols containing the same information were identified and deleted. Ward was registered based on a seven- or eight-digit Danish Health Care Classification System (SKS) code, which also identifies administrative hospital groupings (first two digits). Use of hand and foot straps and gloves require fixation with belt and in most analyses were pooled together as one group. Voluntary mechanical restraint and request for door locking by the patient were recorded.

The registration of the first compulsory episode for each person in the three-year period was identified in order to describe sex and age. Each episode of coercion during hospitalization may not occur independently and only the first episode during a given hospitalization was counted.

Transfer between wards (identified using the SKS code) was registered as a new hospitalization. We identified situations in which patients were admitted to another ward the same day as being discharged and had episodes of mechanical restraint the same day registered in both admissions.

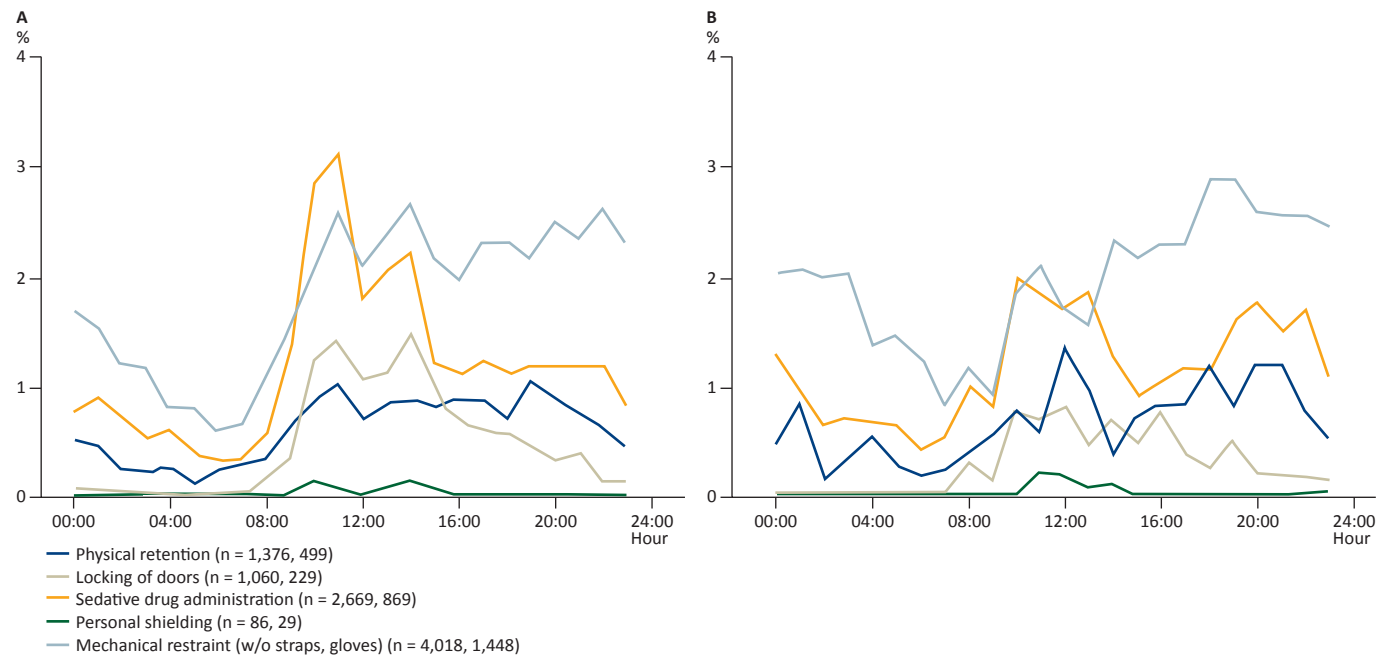
The date coercion was initiated was identified as a weekday or a weekend day, and the month was subsequently divided into quarters. The time at which coercion was initiated was recoded as shift type, i.e.: 07:30 to 15:29 was coded as day shift, 15:30 to 23:29 as evening shift and 23:30 to 07:29 as night shift.

Statistical analysis

The chi-squared test was used for comparison of frequencies with the level of significance set at 5%. Odds ratio (OR) for being subjected to coercion (first episode) outside day shifts at weekdays was calculated using lo-

 FIGURE 1

Diurnal distribution of first episode of coercion (n = 12,283) within each hospitalization by type of coercive measure (Group 3) and time of day for weekdays (A) and in weekends (B). As the use of hand and foot straps and gloves require use of belt, these are pooled together into one group.



n = number of episodes: weekday, weekend; w/o = with or without.

gistic regression with 95% confidence intervals (CI) and adjusted for age, sex and administrative hospital. We further restricted the analysis to first coercive episodes initiated after the first 24 hours of admission to allow for initiation of restraint in immediate relation to the admission. Data were analysed using SPSS v. 23 (IBM, 2015).

The study was approved by the Danish Data Protection Agency (2013-41-2503).

Trial registration: not relevant.

RESULTS

The dataset contained 128,035 records, of which 53,808 (42.0%) included redundant information about the same episodes, possibly due to repeated assessment.

In 888 records, age was missing and four records had negative values, possibly due to patients aged 100 years and above. These 892 cases were excluded. All records describing episodes concerning patients aged 17 years and below (4,716) were excluded, leaving 68,619 records for analysis.

We identified 7,338 unique persons, 3,275 (44.6%) women and 4,063 (55.4%) men. The median age was 46 (interquartile range (IQR): 31-59) years for women and 42 (IQR: 30-56) for men.

The protocols were (n (%)) mechanical restraint (20,330 (29.6)), use of hand and foot straps (14,504 (21.1)), gloves (51 (0.1)), physical retention (12,686 (18.5)), door locking (1,971 (2.9)), sedative drug administration (18,835 (27.4)) and personal shielding (242 (0.4)).

The initiation of the first coercive episode of each specific type by days and shifts is shown in Table 1. In general, coercion was initiated on day shifts more often than on evening and night shifts, and on weekdays more often than on weekend days. Mechanical restraint was the most common first coercive method and, along with physical retention, it was initiated more often in evening than in day shifts, as opposed to locking of ward doors, sedative drug administration and personal shielding.

The first coercive episode of any kind was initiated less often on weekend days than on weekdays (Table 2). On weekdays, most episodes were initiated during the day shifts and slightly fewer in the evening shifts, whereas the opposite pattern was seen on weekends. Generally, fewer episodes were initiated at night for all types of coercion.

Figure 1 illustrates the hourly distribution of the first episode of each type of coercion (for weekdays and weekends, respectively). It suggests that on weekdays, most coercion is initiated during the day shift. Door locking, physical retention and sedative drug administration

TABLE 3

Unadjusted odds ratio of experiencing coercive episodes outside day shift on weekday related to type of coercion, sex, age, and hospital, and adjusted odds ratio of coercive type, first episode in hospitalization and adjusted in a restricted population with first coercion episode after 24 hours of admission.

	Odds ratio (95% confidence interval)		
	unadjusted	adjusted ^a (n = 12,283)	adjusted & restricted ^b (n = 5,353)
<i>Type of coercion</i>			
Physical retention	2.79 (2.40-3.23)	2.70 (2.32-3.16)	3.59 (2.91-4.43)
Locking of doors	1 ^c	1 ^c	1 ^c
Sedative drug administration	1.83 (1.61-2.08)	1.95 (1.70-2.23)	2.22 (1.83-2.70)
Personal shielding	1.09 (0.75-1.60)	1.09 (0.74-1.60)	1.36 (0.86-2.15)
Mechanical restraint w/o straps, gloves	3.14 (2.77-3.55)	3.32 (2.91-3.79)	3.80 (3.12-4.62)
<i>Sex</i>			
Male	1 ^c	–	–
Female	0.91 (0.84-0.98)	–	–
<i>Age group, yrs</i>			
18-25	1 ^c	–	–
26-35	0.77 (0.68-0.87)	–	–
36-45	0.80 (0.71-0.91)	–	–
46-55	0.77 (0.68-0.88)	–	–
56-65	0.73 (0.63-0.84)	–	–
> 65	0.77 (0.67-0.89)	–	–
<i>Administrative hospital group (2 1st SKS code digits)</i>			
Copenhagen (15)	1 ^c	–	–
Zealand (38)	1.41 (1.24-1.60)	–	–
Funen (42)	1.16 (1.01-1.34)	–	–
South Jutland (50)	0.94 (0.77-1.16)	–	–
Southwest Jutland (55)	1.19 (0.95-1.48)	–	–
Fredericia and Kolding (60)	1.30 (1.08-1.55)	–	–
Herning (65)	1.43 (1.08-1.89)	–	–
Central Jutland (66)	1.07 (0.92-1.24)	–	–
Randers (70)	1.12 (0.94-1.29)	–	–
Thy Mors (76)	0.81 (0.66-0.98)	–	–
North Jutland (80)	1.60 (1.36-1.87)	–	–

SKS = Danish Healthcare Classification System; w/o = with or without.

a) Adjusted for sex, age group, and hospital.

b) Restricted to 1st episodes initiated only from the 2nd day of admission or later, adjusted for sex, age group, and hospital.

c) Reference.

level off during the evening, whereas mechanical restraint is typically initiated in the evening shifts. On weekends, the pattern is less pronounced; although mechanical restraint is used increasingly during the evening and the first part of the night. Physical retention and sedative drug administration are typically used late in evening shifts.

The ORs for first coercive episode initiated outside day shifts on weekdays are shown in **Table 3**. Using locking of doors as the reference, as this has the most pronounced day orientation, mechanical restraint is three times as often initiated outside day shift on weekdays, physical retention 2.8 times and sedative drug administration 1.8 times as often. The pattern of initiation of personal shielding did not differ from that of door locking. Males and younger patients had a higher risk of experiencing their first coercive episode outside day shift

on weekdays, and the administrative hospital units were associated with different risks of initiating coercion outside of day shift. Adjusting for sex, age and hospital unit (Table 3, model adjusted) did not change the pattern of initiation.

Restricting the analyses to admissions where the first coercive episode was initiated after the first 24 hours of admission showed that the ORs were markedly aggravated (Table 3, model adjusted and restricted), especially for physical retention.

A total of 236 first mechanical restraints and 149 cases of door locking were requested by the patient. Excluding these episodes lowered estimates in the adjusted model for physical retention to 2.35 (95% CI: 2.00-2.76), for sedative drug administration to 1.64 (95% CI: 1.47-1.95), for personal shielding to 1.00 (95% CI: 0.68-1.48) and for mechanical restraint to 2.85 (95% CI:

2.48-3.28). We identified 74 episodes of first mechanical restraint where the patient at the same day had been discharged from another ward and had been fixated at the last day of admission. Excluding these episodes did not change the estimates.

No seasonal variation was found in relation to shift (Pearson's chi-square 11.256 [df = 6], $p = 0.081$, data not shown).

DISCUSSION

The initiation of coercion was lower outside day shifts on weekdays. Conversely, the diurnal variation in initiating the first episode of different types of coercion is not readily explainable, and it seems surprising that mechanical restraint is often used as the first coercive method, contrasting the principle that the least intrusive type of coercion should be used first [3]. Being male and young increases the risk of being subjected to coercive measures outside day shifts on weekdays. Administrative hospital units differ by more than 50% with respect to initiation of coercion outside day shifts.

Four studies [9, 12-14] have described the association of coercion with time of day and week. In accordance with the present study, two [9, 12] found that restraints primarily occurred during the daytime and were more frequent on weekdays [9]. Another study [13] found restraints to occur around midnight and during the first four weekdays and with a trend towards being used during change of shifts (from evening to night shift and from night to day shifts). The last study [14] found no variation in coercion.

One study found increased use of coercion in the autumn and winter [12], but this study was conducted in a hospital in the polar region of Norway. Our study did not detect any seasonal variation.

In the present study, comparison was made with locking of doors, which was the most day-oriented type of coercion (Figure 1), and the estimates of the other coercive types were compared with locking of doors in order to examine any deviations from day-orientation.

The use of coercion on day shifts [9, 12] might reflect that patients actually sleep at night with fewer stimuli giving rise to restlessness and aggression. Patients who are admitted acutely outside of the day shift may be more aggressive than those admitted during the day shift on weekdays, and this may explain the need for certain coercive measures. But restricting the analysis to admissions where the first coercive episode was initiated after one full day of admission did not level off the risk. This suggests that mechanical restraint and physical retention are more often initiated outside of day shifts, also during admission.

The differences between administrative units is not readily explained; it might reflect differences in hospital

and ward types or in administrative procedures or staff preferences, but it seems relevant to explore further.

We analysed only types of coercion belonging to Group 3. Other types are only initiated to a much lesser degree outside of office hours. Compulsory admission and detention by force (Group 1) are decided by a consultant and are typically executed on a day shift. Involuntary treatment (Group 2) will typically follow lengthy motivating of the patient aiming for voluntary participation in treatment; the decision has typically been discussed at ward conferences; and the decisions are made by the consultant, primarily on the day shift. The decision is only rarely made during other shifts and on weekends. Only the first episode in a given hospitalization was included. This was decided as episodes of recurrent coercion would probably be related to both the occurrence and type of first coercion. Furthermore, the number of episodes would reflect the length of admission, which would also call for more sophisticated statistical modelling.

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 might be registered randomly at the wards. This means that the number of first initiated mechanical restraints, either alone or in conjunction with other coercive measures, must be considered a minimum number.

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 [15].

Some protocols may not have been registered, but this would only lead to bias in our study if any lacking episodes were related to time of day or week. Protocols might be skipped on busy shifts, but they would probably be registered within the ten-day period granted by the MHA [3]. In order to examine the validity of the TIP, journals of patients could have been scrutinized to examine whether episodes of coercion were missing in TIP.

We had no information about the timing of shifts and defined them arbitrarily. Using 07:00 and 23:00 o'clock instead changed estimates in the adjusted model by less than 10%. Different lengths of shifts (e.g. 12 hours) may lead to a higher risk of coercion if the coercive episodes were related to fatigue among the staff members.

Information about holidays was not included, but such information would probably lead to a non-differential misclassification if holidays resemble weekend days.

The psychiatric diagnosis itself influences the use of coercion, as patients with, e.g., schizophrenia are more often subjected to coercion [16] and could, as well as staff characteristics, ward types (open, closed) and shift

duration (eight- or 12-hour shifts), have been included as a confounder.

It was not possible to identify patients staying at somatic wards for involuntary somatic treatment.

We included patients admitted to the National Maximum Security Ward in the analyses. Excluding first episodes in this ward (22 admissions) did not change estimates substantially.

CONCLUSIONS

Although the number of initiated Group 3 coercive measures was higher during day shifts on weekdays, the patients' risk of being subjected to mechanical restraint, physical retention and sedative drug administration outside day hours was markedly higher than the risk of having their door locked.

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