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Chapter 5.

Methodological issues in monitoring the use of restrictive measures.

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Abstract

Purpose: In many European countries, initiatives have emerged to reduce the use of seclusion and restraint in psychiatric institutions. In order to study the effects of these initiatives at a national and international level, consensus on definitions of coercive measures and methods for assessing and calculating the prevalence's of these measures are required. The aim of this article is to identify problems in defining and recording coercive measures, provide recommendations for consistent comparable measurements and meaningful data-analyses and to illustrate the relevance of the proposed framework.

Methods: Relevant literature was reviewed to identify definitions and calculation modalities for the measurement of coercive measures in psychiatric in-patient care. Figures on the coercive measures and epidemiological ratios were calculated in a standardized way. To illustrate how research in clinical practice on coercive measures can be conducted, data from a large multicenter study on seclusion patterns in the Netherlands were used.

Results: Twelve Dutch mental health institutes serving a population of 6.57 million inhabitants provided their full data set regarding the used coercive measures. A total of 37 hospitals and 227 wards containing 6812 beds covering 31,594 admissions in 20,934 patients were included in the study. A large variation in ward and patient characteristics between the institutes and wards was identified. The chance to be secluded per capita inhabitants of the institutes catchments area varied between 0.31 and 1.6 per 100.000. Between mental health institutions, the duration in seclusion hours per 1000 inpatient hours varied from less than 1 up to 18 hours. The number of seclusion incidents per 1000 admissions varied between 79 up to 745. The mean duration of seclusion incidents of nearly 184 hours may be seen as high in an international perspective.

Conclusion: Coercive measures can be reliably assessed in a standardized and comparable way under the condition of using clear joint definitions. Methodological consensus between researchers and mental health professionals on these definitions is necessary to allow comparisons of seclusion and restraint rates. In this study recommendations are made to contribute to an international standard on gathering data as well as calculating outcome parameters on the use of coercive measures.

Keywords

Coercive measures, seclusion, registration, analysis, expressing outcome.

Introduction

In European countries, coercive measures such as seclusion and physical and mechanical restraint are widely used in clinical practice. Yet, in many countries these measures are regarded as controversial in managing violence and aggression in acutely ill psychiatric patients (Janssen, Noorthoorn, de Vries et al 2008; Steinert, Lepping, Bernhardsgrütter et al. 2009). Literature suggests little, if any, therapeutic value of these measures (Bowers, Simpson, Alexander et al 2004; Bowers, van der Werf, Vokkolainen et al 2007; Lendemeijer & Shortridge-Baggett 1997; Sailas & Fenton 2000; Kaltiala-Heino, Tuohimaki, Korleila et al 2003; Haglund, von Knorring, von Essen 2003).

The current literature on coercive measures reveals an increasing number of studies comparing seclusion and restraint rates between wards, mental health institutes, regions or countries. Studies in Europe and the US indicate that between 10 and 30% of patients admitted in acute psychiatric wards are exposed to seclusion, restraint or forced medication (Steinert et al 2009). Such data are hard to compare, since seclusion and restraint are rarely systematically recorded [Janssen et al. 2008; Busch & Shore 2000], nor analyzed, calculated or expressed in a consistent way (Bowers 2000; Janssen, Hutschemaekers, Lendemeijer 2005; Steinert & Lepping 2008).

Janssen et al. (2008) and Steinert et al. (2009) reviewed several comparative coercive measure studies from Australian, American and European hospitals published since 1990. These studies show widely disparate non-uniform measured rates of seclusion and restraint. The overall lack of specific background information such as demographic characteristics of the admitted patients, number of beds and the daily bed occupation in the respective hospitals further hampers appropriate comparison. In addition, consistency problems in expressing seclusion and restraint rates and the heterogeneity of methods impede sound conclusions and impair informed discussions on these interventions. In an effort to solve these methodological problems, Bowers (2000) discussed epidemiological rates such as number of seclusions per 100 admissions or per 100 occupied beds, to bridge differences in size of the hospitals, wards and patient throughput.

The current study elaborates further on the development of unambiguous definitions and methods for assessment, analysis, calculation and expression of coercive measures, using seclusion as main item to clarify various definitions and to provide examples of calculations. Furthermore, we propose how to use the collected rates on coercive measures for feedback and comparison purposes on the level of the intervention, admission, patient, ward and the hospital. Depending on the level, different numerators and denominators are required. The different ways to express coercive measure rates are illustrated with seclusion data from a multicenter database in Dutch mental health care institutions.

Method and materials

In the Netherlands, five mental health institutes and the Dutch mental health inspectorate jointly developed a rating scale to register the use of restrictive measures: the Argus-scale. The Dutch mental health inspectorate needed valid and reliable coercive measure data that could be easily gathered in daily practice. A study on the data of twelve psychiatric hospitals over 2002-2003 had shown that the figures gathered after implementation of the Special Admissions in Psychiatric Hospitals Act (Wet Bopz) in 1994 were barely reliable (Janssen et al. 2008).

The main objective of this newly developed rating scale was to record the number and duration of seclusion and restraint measures per patient more in detail. The Argus-scale is completed by nurses, for all patients regardless of the legal status and whether the patient objected to the use of the coercive measure or not. Nurses were instructed to rate each coercive measure for each day separately. The exact time of the start and the end of each coercive measure is also entered in the database, allowing the calculation of episodes (Fisher 2003).

Definitions on coercive measures in the current study.

The Argus-scale covers three main coercive measures: seclusion, restraint and enforced medication.

1. Seclusion is defined as bringing the patient into a locked room where he/she is alone and able to move around but unable to leave due to a locked door (Steinert & Lepping 2008) for some time, irrespective of the circumstances and safety preconditions. In the literature, seclusion is related to several underlying concepts, for example a designated area, minimal furnishing, social isolation as a consequence, egress and compulsion as a prerequisite, time as a delimiter or rationalisations for its use in the context of a closed ward (Mason & Alty 1994). The definition we propose only refers to being locked into a room (seclusion room, isolation room, (stripped) bedroom or otherwise designated area), regardless of the purpose for which this is done. The frequency of intermitted security checks and closeness of nursing staff during seclusion differ from country to country.
2. Mechanical and manual restraint is defined as immobilizing the patient with external mechanical devices or physical force. Mechanical restraint refers to the use of belts to fix a patient to a bed or chair (Steinert & Lepping 2008). Manual restraint refers to immobilizing the patient on the floor (Steinert & Lepping 2008) or upright by staff members, to calm down through specific holding techniques.

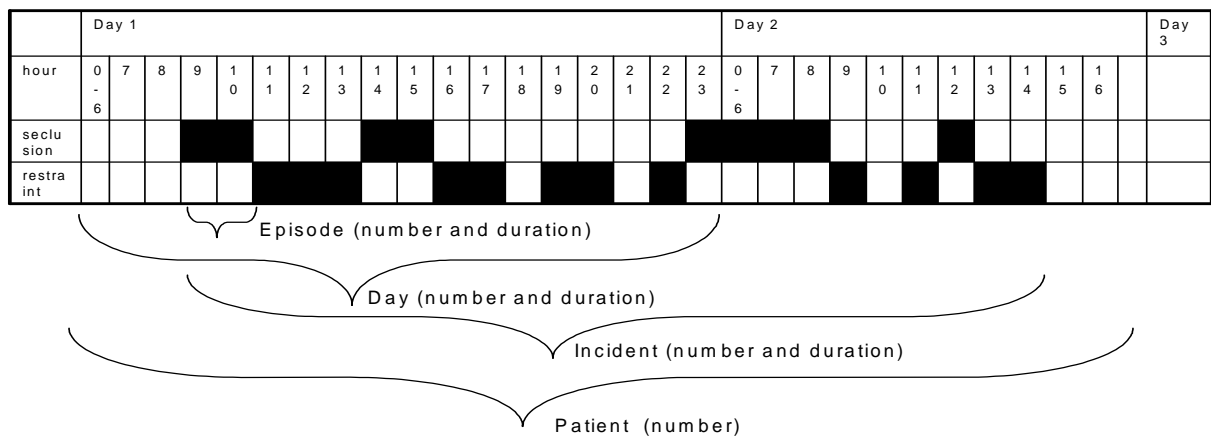
- Enforced medication is defined as application of intramuscular medication by force or by definite psychological pressure, i.e. announcing intramuscular medication if medication is not taken orally at once (Steinert & Lepping 2008; Bowers Alexander, Simpson et al. 2004).

Calculations on coercive measures.

In calculating outcome parameters using Argus data the time frame of a seclusion or restraint intervention is described in two ways:

- An episode is defined as the period from the beginning (closing the door when the patient is in the room or locking the restraint belt) to the discontinuation (opening the locked door or removing the restraint belt). In other words, we use the term episode as a synonym of the discrete seclusion, according Crenshaw & Francis (1995).
- An incident is derived from the epidemiological term incidence and covers a sequence of episodes without a discontinuation of more than 24 hours. An interruption of more than 24 hours leads to the count of a new incident of seclusion, restraint or forced medication. Figure 1 illustrates these definitions.

Figure 1. Notifications on intervention level (seclusion and restraint measures) within an patient admission



Coercive measures are applied to individual patients at wards. Comparisons between wards and hospitals are dependent on the characteristics of these patients (Steinert, Martin, Baur et al. 2006), as well as on characteristics of wards (Mason & Alty 1994, Bowers et al. 2004) or staff on the wards (Janssen, Noorthoorn van Linge et al. 2007). For the purpose of this study we used patient's characteristics such as sex, age, ethnic origin and primary diagnosis and ward characteristics such as size and ward type. In the comparisons between wards these variables need to be taken into account as denominators, the coercive measures as numerators.

With respect to the ward characteristics, the number of beds and seclusion rooms were counted. The ward types were categorized in four groups, acute admission wards, long stay wards, residential wards for the care of geriatric psychiatric patients, and specialized wards. Acute admission wards are defined as wards with non-selective admission criteria to serve emergency psychiatric services in a specific catchments area. In long stay wards severe mentally ill patients tend to stay more than 9 months for treatment and rehabilitation trajectories. Residential wards provide treatment but also long term living arrangements for elderly patients with primarily organic brain disorders. Specialized wards serve specific patients groups, such as dual diagnosis patient categories (intellectual disability and severe mental illness, brain trauma, addiction and severe mental illness). Specialized wards have a national or at least above catchment area impact.

Levels of analyses.

To provide insight in patterns of coercive measures, five different levels of calculations over several time frames can be used. Figure 2 illustrates what kind of outcomes are generated by analyses on these various levels. Each level has specific input variables, requires specific calculations, and provides output only comparable within the same level. Data from a lower level can be used for the next higher level. For the illustration of outcome we used a timeframe of one year.

The fifth, and highest level is the mental health institute level, more specifically the specific urban or rural context and varying numbers of inhabitants in the defined catchment areas. Rural is defined following OESO classifications as serving less than 150 inhabitants per km² (Terluin, Slangen, Leeuwen et al. 2005), urban as serving more. The organization of mental healthcare in the Netherlands implies that specific mental health institutes need to cover a specific catchment area. The size of the mental health institute and the type of patients it serves are variables that need to be taken into account in interpreting the data and informing clinicians. On the mental health institute level we focused on all coercive measures within one year. The coercive measures were related to mental health institute variables, such as (1) number of inhabitants in the mental health institute's region, (2) location of the mental health institute (mainly rural or urban), (3) presence of high secure wards, (4) number of occupied beds of the wards, and (5) number of admissions. Correction for the number of inhabitants is necessary to perform standardization to a specific number of admissions; in addition to this it is needed to see whether differences in number of admitted patients within certain diagnosis, age, and gender categories may explain differences in seclusion rates. The results on this level represent the prevalence of coercive measures as numerators, with the number of inhabitants,

admissions, in-patient days or treated patients as denominators. The denominators were standardized to 100.000 inhabitants and 1000 admissions or inpatients' days.

The fourth level refers to the characteristics of specific wards. Most wards within a mental health institution normally vary in bed-size, age category, treatment focus, level of security and average duration of stay (Janssen et al. 2007). These variables need to be taken into account when comparing rates of the use of coercive measures at multi-ward level. Thus, at the specific ward level the coercive measures were related within a time span of one year to (1) the number of daily occupied beds, (2) the number of admissions, and (3) the number of occupied beds, or more specifically the number of bed hours excluding the hours of leave, for each ward separately. Comparisons on this level

Figure 2. Levels of analysis.

Levels	Denominators (number of)	Numerators (number of)	Correction factors (number of)	Ratios and figures	Comparison goals
5. Hospital	Occupied beds Inhabitants of region Admissions	Started seclusions	Ethic minority patients	Incidents / 100.00 inhabitants	International
		Started restraints	Admission beds	Incidents /1000 admissions	National Benchmark
		Given PRN Medication	Long stay beds	Days / 1000 admission days	National ranking
		Patients	Patients in diagnostic groups	Hours / 1000 inpatient hours	Monitoring at hospital level
		Days in seclusion	Competitor hospitals in same area	Number of patients	
		Hours in seclusion		Number of incidents	
		Days in seclusion			
		Hours in seclusion			
4. Ward	Occupied beds Admissions Bed hours	Started seclusions	Staff occupancy	Incidents /1000 admissions	Benchmark between same wards
		Started restraints	Ward facilities (comfort rooms/ PICU)	Days / 1000 occupied days	Monitoring at ward level
		Given PRN Medication	Ward types	Hours / 1000 inpatient hours	Team management information
		Days in seclusion	Ward size	Number of patients	Quality control
		Hours in seclusion		Number of incidents	
		Days in seclusion		Number of episodes	
		Episodes in seclusion		Relative risk between wards	
3. Patients	Patients in age groups Patients of certain gender Patients in diagnostic groups Patients with high or low GAF	Patients involved in seclusion	Staff per patient	per restrictive measure:	Mental health inspectorate control
		Patients involved in restraints	Space per patient	% age	Medical directorate
		Patients receiving PRN med.		% male/female	Patients advocates
		Diagnostic categorisation		% per ethnic groups	Ward psychiatrist
		Started seclusions		% per diagnosis	
		Days secluded		% per higher of lower GAF	
2. Admission	Number of re-admissions Length of stay	Started seclusions		Number of incidents	Ward psychiatrist monitoring
				Number of days	Ward nurses monitoring
				Number of hours	Ward managers monitoring
				Mean duration per days	Mental health inspectorate control
				Mean duration per episode	
1. Intervention		Seclusion episodes			Evaluation treatment plan
		Restraint episodes			Mental health inspectorate control
		Episodes of receiving PRN med.			

are interesting for wards with similar characteristics and may be most helpful for designing specific interventions for specific patient groups. Even though the calculations of the numerators are similar to the calculations on mental health institute level, specific wards may be more interested in learning of specific patterns. Examples as such are: the duration and numbers of patients exposed to seclusion related to ward admission patterns in specific time frames. In addition to this, relative risk for patients being exposed to coercive measures at different wards of a mental health institute may help to interpret patterns of incidence and duration. On the mental health institute level and ward levels single or repeated occurrence of coercive measures within single patients is an important distinctive variable. More severely mental ill patients may be associated to a higher risk for aggression and subsequently be exposed to repeated coercive measures [Bowers 2000; Janssen et al. 2005; Martin, Kuster, Baur et al. 2005].

The third level is the patient level. This level implies an elaboration of specific patients characteristics within this population either secluded or not. Analyses on this level are important for epidemiological research and hospital management. Analysis at this level allows calculation of associations between static and dynamic characteristics (Kaltiala-Heino et al. 2003; Ahmed & Lepnurm 2001, Betemps, Somoza, Buncher 1993; Kaltiala-Heino, Korkeila, Tuohimäki et al. 2000; Bower, McCullough, Timmons 2000; Fisher 1994, Steinert et al. 2006; Way & Banks 1990) of seclusion and restraint by means of stratification. For example, do patients with specific DSM-IV axis I or II disorders have more or less risk of being exposed to seclusion or restraint? In addition to this: age, sex, ethnic background as well as GAF scores may be taken into account in comparing individual risk to average risk of being exposed to coercive measures. For example, what is the risk in terms of days in seclusion per number of admission days of a patient with for example a psychotic disorder? What is the risk of an older patient to be repetitively restrained? Identification of patients with a extraordinary high number of seclusion incidents may be relevant for the Mental Health Inspectorate (IGZ) as well as for medical directors in their hospital work package.

The second level refers to the patient's admission on a specific ward and / or mental health institute. Frequency, time of the day and duration of coercive measures can be correlated with local contextual variables such as location of the ward, ward culture or the possibility to manage difficult patients behaviour either in their own ward or in more specialized ward.

Finally, the first level is the level of separate seclusion and restraint episodes and incidents per individual patient. This information may be used in treatment plan evaluations and more in general to develop strategies to manage challenging behaviour in a less restrictive but safe way. The IGZ will be focussed on this information during routine audits. The information on this level provides individual information

crucial to reflect on the information derived from the third level to answer questions on why specific patients or patient groups have distinct chances to be exposed to coercive measures.

Relevance of the levels. Ratios and figures within the fifth level and the fourth level are in general the same, as well as the ratios and the figures in the three lowest levels. The figures within level 4 and 5 are important for the institute management officers, while the figures in the three lower levels are relevant for nurses, therapists, ward management and especially the medical director in order to comply with information required by the mental health inspectorate. The first represent general figures while the second represent outcome at an individual basis.

Data collection

Four large Dutch mental health institutes started collecting data with the Argus-scale in 2007. Other mental health institutes followed in subsequent years. In the Netherlands up to 22 mental health institutes now participate on a voluntary basis in developing a national benchmark database, these numbers covers about 75% of all mental health institutes in the Netherlands. As far as we know, the database currently is the largest single database on coercive measures in Europe. After applying for participation the data of each institute are checked and controlled by two supervisors, the first and third author of this paper. The data presented in the current study were collected in 2008 or 2009 and covered all the wards of each mental health institution for a full year. Inclusion was therefore limited to the first twelve participants.

Statistical Procedures

Most of the figures presented here are descriptive in nature. Odds ratios were used to calculate the chance of seclusion within several diagnostic groups, wards or mental health institutes.

3. Results

In this study, 12 mental health institutes provided their full data set, all together 37 psychiatric hospitals. The mental health institutes were located all over the Netherlands, five in an urban area and seven in a rural area. All participating institutes had a non-selective admission policy in their catchment area. In total, the institutes served a population of 6.57 million inhabitants, about 41 % of the total population in the Netherlands. A total of 227 wards were included with a total of 6812 beds covering 31,594 admissions of 20,934 patients either once or more often. The reliability of the Argus rating scale was determined by comparing the results to other sources of information such as the data of the Dutch Inspectorate of the

Ministry of Health, nurses' care plan records in four hospitals over one month. The comparison between Argus-scale and other sources revealed percentages of agreement between 85 and 96% and a Cohen's Kappa's between 0.64 and 0.92 for the measures of seclusion.

Table 1. Characteristics of the participating institutes and admitted patients.

	Institution 1	Institution 2	Institution 3	Institution 4	Institution 5	Institution 6	Institution 7	Institution 8	Institution 9	Institution 10	Institution 11	Institution 12	Totals
Urbanization	Rural	Rural	Rural	Rural	Urban	Rural	Urban	Urban	Urban	Rural	Urban	Rural	
Number of inhabitants in catchment area	390000	700000	600000	512000	656000	650000	900000	400000	382000	500000	600000	280000	6570000
Number of hospitals within Institutions	2	5	4	5	2	4	3	3	3	2	2	2	37
Type of wards in the study													
Number of admission wards	4	6	6	3	4	6	4	4	4	3	5	2	51
Number of long stay wards	3	3	3	5	8	3	3	10	3	4	5	3	53
Number of residential wards for elderly	3	7	1	3	10	4	4	4	5	2	2	2	47
Number specialized wards	1	5	6	5	20	7	3	4	3	3	15	4	76
Total number of wards	11	21	16	16	42	20	14	22	15	12	27	11	227
Number of beds included in the database	265	771	640	798	842	775	533	582	412	309	521	364	6812
Number of observed newly admitted patients	1260	2274	1056	1189	2516	1544	3470	1542	1243	1753	2053	1034	20934
Bed occupancy included during 2008 or 2009	96725	295530	173.327	258839	235637	271143	277108	190277	137299	302375	310165	133551	2681976
Total admissions	1828	3001	1205	2108	3358	2175	4533	2884	3307	2859	3136	2285	32697
Number of seclusion rooms available	17	18	21	16	19	6	25	20	22	9	27	11	211
Mean age of all admitted patients	42.3	47	45	47.1	44.6	46	39.1	43.7	47.0	40.3	40.4	47.1	43.8
% Male	44.8	38.8	51.5	56.8	61.3	43.0	72.0	53.1	46.1	52.3	61.6	52.8	54.6
% Ethnic origin	7.4	5	4.2	5	7.2	6	29.2	36.9	11.0	6.8	10.6	10.8	13.5
Primary diagnosis													
% Diagnosis unknown	9.8	23.3	5.8	30.7	31.4	2.6	0.2	16.6	17.8	19.8	9.8	9.5	15.1
% Psycho- social disorders	6.5	13	4.3	9.1	2.3	4.2	7.0	0.3	1.8	11.9	3.2	5.9	5.7
% Anxiety disorders	12.2	9.5	9.0	9.7	3.1	10.3	6.4	1.2	1.4	9.1	5.7	13.6	6.8
% Depressive disorders	9.6	18.5	13.8	8.7	5.8	18.6	7.4	2.4	15.9	11.0	9.3	12.6	10.8
% Bipolar disorders	7.9	4	9.2	3.1	2.8	7.3	7.0	7.4	9.1	4.9	4.7	7.5	6.0
% Schizophrenic disorders	38.9	13.4	38.5	13.3	18.4	30.0	33.8	64.0	33.6	19.9	34.4	24.5	29.8
% Psycho – organic disorders	9.5	13.8	4.1	5.6	4.7	7.1	10.5	1.0	7.7	5.7	3.3	6.3	6.8
% Drug Abuse	2.8	1.9	6.1	13.9	29.3	3.1	3.0	5.3	3.5	11.4	12.2	12.8	9.2
% Personality disorder	0	1.1	9.2	5.6	2.2	5.9	17.9	1.8	9.1	6.2	39.9	43.3	12.8

Table 2. Characteristics of admission wards (one per institute) and admitted patients.

	Instituti on 1	Instituti on 2	Instituti on 3	Instituti on 4	Instituti on 5	Instituti on 6	Instituti on 7	Instituti on 8	Instituti on 9	Instituti on 10	Instituti on 11	Instituti on 12	Totals
Number of beds available	11	10	50	27	22	31	34	40	30	28	21	36	340
Number of admissions	94	139	170	168	154	271	388	896	155	653	242	793	4129
Absolute number of occupied beds.	3768	2986	18570	9882	8052	11467	12373	14454	11260	9434	7185	12698	122129
Mean days of stay within an admission	40	21	109	59	52	42	32	16	73	14	30	16	30
Number of seclusion rooms available	3	2	3	2	3	1	2	6	1	4	2	4	33
Age: % 18-40 years	51.9	43.9	52.3	49.7	54.5	51.0	43.2	53.7	52.3	43.0	64.5	50.9	50.3
% 41 – 65 years	46.2	50.7	44.4	34.4	44.8	47.7	54.0	40.5	47.4	54.7	35.5	48.7	46.6
% 66 – older	1.9	5.4	1.9	9.2	0.7	1.1	2.9	5.7	0.0	2.5	0	0.5	2.8
% Male	55.8	60.8	46.8	54.8	74.7	57.0	46.9	57.1	55.8	46.4	50	46.2	52.1
% Ethnic origin	9.6	5.5	3.3	8.3	5.1	0	9.1	43.2	44.2	6.6	12.4	12.0	17.1
Primary diagnosis													
% Diagnosis unknown	17.3	14.9	6.2	27.4	51.9	0.7	12.1	18.1	9.3	26.1	7.9	10.9	16.4
% Psycho- social disorders	4.8	4.1	6.0	7.7	0	3.6	2.1	1.8	1.2	7.8	3.3	8.6	4.8
% Anxiety disorders	7.7	3.4	9.7	1.2	0.6	5.3	4.6	4.0	2.3	10.9	9.1	22.8	9.1
% Depressive disorders	5.8	12.2	15.7	11.9	4.5	9.9	12.6	7.1	25.6	16.2	8.7	14.8	12.1
% Bipolar disorders	9.6	10.8	12.0	3.6	2.6	9.6	9.1	4.3	12.8	5.4	8.3	5.8	6.7
% Schizophrenic disorders	46.2	44.6	36.1	30.4	23.4	38.7	47.8	47.0	25.6	21.1	45.0	13.1	32.9
% Psycho – organic disorders	1.0	2.0	5.6	4.8	0	4.3	3.0	1.9	2.3	2.9	1.2	4.2	2.9
% Drug Abuse	1.9	7.4	4.6	11.3	14.3	3.0	8.7	8.2	5.8	6.7	8.3	14.4	8.8
% Personality disorder	5.8	0.7	4.2	0	1.3	21.5	31.9	7.6	15.1	33.2	37.6	47.5	23.6

Table 1 shows the main characteristics of the participating institutes. In this table considerable variation in availability of seclusion rooms may be identified. While most institutions had about one seclusion room for 50 patients, institutes number 6 had less than one seclusion room for every 100 patients. Furthermore, substantial differences in patient characteristics such as age, gender, and ethnic background between the institutes can be identified. Considerable variation was also present in the available data on diagnostic characteristics. All these features need to be taken into account in the interpretation of the outcomes. This issue will be explored more in-depth in the discussion section.

For each of the twelve participating institutes, one acute admission ward was selected to illustrate the characteristics at the ward level (Table 2). The size of these acute admission wards varied between 11 and 50 beds. All wards had at least one seclusion room; availability differed between one per 4 beds up to one per 17 beds.

Large variations were identified between wards in diagnostic categories. For example, while in the acute admission ward of institute number 6 no diagnosis on DSM Axis I was recorded for 1% of the patients, whereas this was the case for 51% of the patients admitted on the selected acute admission ward in institution 5. The prevalence of DSM-IV schizophrenia codes reached towards 13.1% (acute admission ward in institute number 12) but was much higher in an acute admission ward in institute number 7 (47.8%). Mood disorders DSM-IV codes differed between 4.5% (acute admission ward, institute number 5) and 25.6% (acute admission ward, institute number 9). Drug abuse was registered infrequently as a primary diagnosis in some institutes whereas others showed percentages up to 14.4% (acute admission ward, institute number 12).

The figures and epidemiological ratios of seclusion incidents as well as episodes at institute level, ward level, and patient level, are depicted in table 3. On the institute level, substantial differences were found in the duration of seclusion hours per 1000 inpatient hours: these vary from 0.3 to 18. The number of seclusion days per 1000 inpatient days also varies strongly between the institutes (range 1-50), much stronger than the rate of seclusion incidents per 1000 admissions (range 79-745) or the number of incidents per 100.000 inhabitants (range 0.31-1.60). Notably, the percentage of incidents for individual patients with more than one seclusion incident does not explain these differences, as these percentages are comparable between the institutes (mean 62.8; range 53.2-79.4). The number of incidents per 1000 admissions seems somewhat higher than most international figures, but the length of these incidents as expressed in the duration per 1000 inpatient hours is surely higher (Janssen et al. 2008; Steinert et al. 2009).

Table 3. Ratios and figures of seclusion per institute.

		Institutio	Instituti	Instituti	Instituti	Instituti	Instituti	Instituti	Instituti	Instituti	Instituti	Instituti	Instituti	Totals	
Level		n	on	on	on	on	on	on	on	on	on	on	on		
		1	2	3	4	5	6	7	8	9	10	11	12		
Institution	Number of patients in seclusion	115	156	232	163	196	172	220	202	113	172	208	75	2024	
	Number of seclusion incidents	374	423	560	475	1079	638	276	370	280	281	376	308	5440	
	% Patients with repeated incidents	29.9	25.2	45.8	22.8	34.0	27.8	25.8	31.7	29.2	23.8	28.7	27.6	30.0	
	Mean N of incidents in patients with repeated incidents	3.8	3.8	4.6	3.9	6.3	4.7	3.4	3.3	3.4	3.6	3.2	3.1	4.0	
	% Incidents within patients with more than one incident	1.03	0.70	0.90	0.90	1.60	0.98	0.31	0.92	0.73	0.56	0.62	1.10	0.82	
	Seclusion incidents per 100.000 inhabitants	204	141	745	399	428	293	79	128	225	160	183	134	259	
	Seclusion incidents per 1000.000 inhabitants	50	13	9	10	5	1	8	45	14	3	7	7	12	
	Seclusion incidents per 1000 admissions	18	6	10	5	5	0.3	4.52	12.2	5.5	1.7	9.6	3.3	6.0	
	Seclusion days per 1000 occupied beds														
	Seclusion hours per 1000 inpatient hours.														
Admission Ward (one per institute)	Number of patients in seclusion at the admission ward	14	56	36	27	56	31	29	57	12	52	33	47	38	
	Number of seclusion incidents	54	106	65	60	146	68	37	84	18	184	94	104	85	
	Seclusion incidents per 1000 admissions	574	751	382	411	948	251	388	586	116	282	388	131	434	
	Number of seclusion days	506	379	258	287	376	340	207	297	156	740	815	282	387	
	Seclusion days per 1000 occupied bed days	134	127	14	28	85	30	17	45	14	78	113	22	59	
	Number of episodes seclusion	1078	1101	439	310	146	252	525	1925	285	2110	571	641	782	
	Relative risk to seclude patients of admission ward	0.95	11.1	1.55	2.26	6.35	1.50	1.48	7.72	1.12	12.5	2.6	1.7	4.2	
Patient % within the secluded over the full institute	Age: % 18 40 years	57.2	37.7	55.6	62.5	70	38.7	36.2	46.2	54.6	37.7	59.3	57.5	50.7	
	% 41 – 65 years	42.9	55.4	38.9	37.5	30	12.9	21.7	43.8	38.5	63.3	37.8	35.9	37.7	
	% 66 – older	0	3.6	2.8	0	0	45.2	37.0	10.1	7.0	0	2.9	6.2	10.4	
	% Male	64.3	69.6	47.2	62.5	74	58.2	70.3	51.4	60.1	53.3	60.4	65.1	60.8	
	% Ethnic origin	14.2	3.6	2.8	8.3	6	3.2	14.1	38.1	16.8	13.1	16.2	19.5	12.7	
	Primary diagnosis % Diagnosis unknown (OR admission & other wards)	14.3	35.7	2.8	20.8	64	0	19.6	4.6	7.0	23.0	1.6	12.8	17.3	
	% Psycho- social disorders	(0.79)	(3.09)	(0.71)	(0.69)	(4.98)		(0.68)	(0.79)	(1.19)	(1.14)	(0.18)	(0.92)	(1.19)	

		Institutio	Instituti	Instituti	Instituti	Instituti	Instituti	Instituti	Instituti	Instituti	Instituti	Instituti	Instituti	Totals
Level		n	on	on	on	on	on	on	on	on	on	on	on	
		1	2	3	4	5	6	7	8	9	10	11	12	
	% Anxiety disorders	7.1	0	11.1	0	0	3.2	2.9	6.6	0.7	7.4	4.5	12.8	4.5
	% Depressive disorders	0	10.7	8.3	0	4	3.2	3.3	15.3	9.8	7.4	14.1	4.6	7.1
	% Bipolar disorders	14.3	8.9	16.7	4.2	2	12.9	18.5	9.7	15.4	9.8	8.2	11.8	11.0
	% Schizophrenic disorders (OR admission & other wards)	42.9 (0.87)	37.5 (2.45)	44.4 (1.52)	37.5 (1.43)	20 (0.72)	51.6 (4.10)	43.5 (1.71)	50.5 (1.13)	41.3 (1.03)	34.4 (2.21)	45.7 (1.72)	26.7 (1.03)	38.2 (1.70)
	% Psycho – organic disorders	0	0	5.6	0	0	0	4.0	1.0	4.9	2.5	2.1	3.6	2.0
	% Drug Abuse	0	3.6	8.3	25	8	0	6.5	9.2	2.8	8.2	6.6	19.5	7.9
	% Personality disorder	14.2	1.8	2.8	0	2	29.1	15.3	27.8	12.6	22.1	39.9	49.2	16.9
	% GAF: > 60	28.5	7.2	22.4	16.7	14	3.2	4.3	4.6	31.5	16.2	2.9	20.5	12.8
	40 - 60	49.9	50.2	36.1	62.3	48	19.4	45.9	22.2	38.5	67.5	62.5	49.2	45.5
	< 40	21.3	42.6	41.5	21	38	77.4	49.7	73.2	30.1	16.3	34.5	30.3	41.6
Admission	Number of seclusion incidents	9	1	1	1	2	4	3	4	2	1	2	2	2.35
	Number of days	217	2	4	2	9	10	15	6	6	14	5	2	18
	Duration in hours	3341:50	14:30	47:00	22:05	194:25	22:00	158:00	57:58	73:00	116:45	25:00	4:00	183:54
	Mean duration per day (hh:mm)	15:25	7:15	11:45	11:02	21:35	2:06	10:31	9:67	12:11	8:21	5:00	2:00	4:54
	Number of episodes	560	3	6	3	10	4	42	27	36	50	6	2	82
	Mean duration of episodes (hh:mm)	6:00	4:50	7:50	7:20	19:27	5:30	3:46	2:09	2:01	2:35	4:12	2:00	2:14

On the level of the acute admission ward (i.e. the fourth level), 94 to 896 patient admissions took place during one year (Table 2). Of these admitted patients 14 up to 57 patients experienced at least one or more seclusion incidents (Table 3). The number of (seclusion) days per 1000 occupied bed days varied between 14 and 134, a staggering difference.

The relative risk of being exposed to seclusion varied strongly on the acute admission wards compared to the other wards of the institute. For example, patients admitted to the acute ward in institute number 2 had a chance more than 10 times higher to be exposed to seclusion than on the other wards in the same institution, while patients admitted to the admission ward in mental health institution 1 had the same chance to experience seclusion as those staying on other wards in this mental health institution (Table 3).

On the patient level, a number of interesting findings emerge. Patients with the absence of a DSM-IV-Axis I code had a much higher risk for experiencing seclusion (OR = 4.98) on the acute admission ward of institute 5 than on the admission ward of institute number 11 (OR = 0.18). Patients with a DSM-schizophrenia code had more than 4 times more chance to experience seclusion on the acute admission ward of institute number 6 (OR = 4.10) than on the acute admission ward of institute number 5 (OR = 0.72). In the institute number 4 and 5 the majority of the secluded patients were between 18 to 40 years of age (62.5 to 70%), while in institute number 2, 6 and 10 the majority of the secluded patients were older than 40 (58%, 61.1 % and 63.3% respectively).

On the admission level, information of randomly chosen patients is presented. This shows great differences in the seclusion figures between patients during their admission. The last column shows the means over of seclusion incident figures over patients throughout the full database. The mean number of seclusion hours per incident was nearly 184.

In short, the most striking difference can be identified in the large variability in the seclusion figures between the participating institutes, with respect to the incidence ratios (incidents per 1000 admissions or per 100.000 inhabitants) as well as the prevalence ratios (days per 1000 occupied beds or hours per 1000 inpatient hours). Internationally compared, the number of incidents per 1000 admissions as well as the absolute duration and the duration of seclusions per 1000 admission hours is in the Netherlands definitely higher (Janssen et al. 2008; Steinert et al. 2009).

4. Discussion

In this article we addressed to several methodological issues when regarding data on the use of coercive measures at a national, institute, ward or patient level with the aim to contribute to the development of consensus on how to record and analyse rates of coercive interventions. Data of 12 mental health institutes were used to illustrate the possibilities of comparing seclusion and restraint figures at several

levels when using a standardized coercive measure rating scale (Argus). It is also important to use consistently one time frame, since varying time frames complicate comparisons. A time frame of one year seems to be preferred, because shorter time frames are sensitive to seasonal variation. In local feedback reporting to staff on the wards however, shorter time frames may be used for to raise the awareness of current patterns in coercive measures at the wards in order to reflect on specific goals they want to achieve in coercion reduction programs. For each level, from the hospital down to the individual level, we discuss how to deal with comparison and interpretation of outcomes for reporting purposes.

Institute level (fifth level).

Using absolute numbers, such as number of coercive measures or number of patients experiencing coercive measures, obviously does not result in meaningful comparisons between hospitals. Using absolute numbers for a comparison within a hospital over several years also results in some shortcomings whereas this does not take into account the size, composition and changes of the institute's infrastructure (Bowers 2000). During the current changes in healthcare institute sizes may vary over time and the admission and discharge rate of patients are not stable within years. Ward types may not be discrete and comparable categories across mental health institutes. Wards of similar types may admit different groups of patients in different circumstances

The number of incidents of seclusion and restraint per 100.000 inhabitants in a hospital's catchment area might be a more powerful way to compare hospitals, given that this is a more stable number. However, this epidemiological calculation only provides a sound comparison if (1) patients from a defined catchment area are always treated in the respective hospital, which probably is the case in some countries but not in others and (2) no other institutes, hospitals or residential homes, apply such coercive measures in the respective catchment area. The calculation of the number of seclusion incidents per 1000 admissions to compare outcomes was previously recommended by Bowers (2000).

This calculation strategy suggests that new patients at acute psychiatric wards are most likely to be exposed to coercive measures. On the level of hospitals, this is only a part of reality. It does not take into account that patients on long-term care wards are sometimes secluded for long periods in countries, like the Netherlands. Using both long term and newly admitted patients as denominator over a period of a year has the same problems as using newly admitted patients only. The percentage of patients with repeated coercive measures as well as the mean number of incidents within this group of patients provides some insight into the degree of overestimation. The overestimation in the incidence per 1000 admissions seems to be similar for all hospitals. The number of seclusion days per 1000 occupied beds is useful for wards having a low turn-over or a population with minimal turnover rates. However, this rate is not directly sensitive to throughput and the figure ignores patients on leave, again a problem for all

hospitals. Also, variations in rates of incidents by this method may be due to variations in length of stay and the severity of the patient's mental illness. Using seclusion hours per 1000 bed hours is a more precise and valid measure and may be preferred in the evaluation of such data. Having Bowers' (2000) recommendations in mind and using the method with caution and consistently we believe that this method can be used for comparisons between hospitals. Identifying the proportion of patients with more than one seclusion incident may help identifying the degree of overestimation. However, this overestimation does not influence interpretation when reporting about the hospitals within a nationwide benchmark.

Ward level (fourth level).

Using absolute numbers on ward level is even more problematic than on hospital level, because the impact of fluctuations in ward size and throughput of patients is greater. The number of seclusion days per 1000 occupied beds also has more drawbacks on this level than on hospital level. The outcomes are rather sensitive for outliers such as single patients with an extraordinary high number of episodes. This is important to consider when studying outcomes at ward level. Especially on acute admission wards, the variations in the number of occupied beds is sensitive to the daily or weekly throughput of patients, the length of stay on the ward and number of discharges from the ward. In general, the bed occupancy on long-term treatment wards and wards for the elderly is more stable.

Another, more important, drawback in using the number of days as a numerator lies in the inherent suggestion that the patient remains in seclusion for the full 24 hours, while in reality there are large variations of time spent in seclusion per day. Our data showed seclusion episodes in the Netherlands usually occurred at largely varying intervals during the day (means between 2 up to 21 hours a day). The number of seclusion hours per 1000 inpatient hours is a refinement in comparison to the seclusion days per 1000 occupied beds.

Seclusion hours per 1000 inpatient hours may be a more sensitive measure for short-term changes in the duration of seclusion during patient stay. The number of seclusion days per 1000 occupied beds and the number of seclusion hours per 1000 inpatient hours are very useful for internal comparisons and comparisons between wards within a single hospital. Nurses can relate these figures to their daily experience.

In line with Bowers (2000) we found that the number of seclusion incidents per 1000 admissions is not sensitive for the length of stay. On acute admission wards, the variation in length of stay is small compared to other types of wards, but still the mean length of stay varies from a few days up to around 30 days. The number of patients at risk for being exposed to coercive measures is small in relation to the newly admitted patients, allowing the use of this figure for comparisons between acute psychiatric

admission wards. For hospitals aiming at the reduction of seclusion and restraint, this rate is likely to be of great relevance. Teams on acute admission wards can use these rates to evaluate their success in lowering the number of seclusion incidents. However, using these rates on other types of wards raises interpretation problems as described above at hospital level. Further studies and more data are necessary for relevant interpretations of these figures in other patient categories like in child and adolescent psychiatry, forensic psychiatry, geriatric-psychiatry and intellectual disability care.

The number and duration of seclusion episodes per day is very sensitive to change, and may show effects of ward policy on seclusion. In hospital number 2 for example, the ward policy is aimed on downsizing a seclusion episode as far as possible. Results showed that patients were in seclusion shorter, on the other hand the some patients were secluded more often which led to an increase in seclusion episodes per seclusion incident. On other wards the policy was to shorten the seclusion episode depending on whether the patient would be calm enough and the team able to handle patient's behaviour on the ward. This different policy leads to a lower number of seclusion episodes within one seclusion incident. These examples illustrate the effect of (implicit or explicit) choices on when and how to seclude a patient. On ward level, figures on episodes are helpful in evaluation of policies.

Determining the relative risk for seclusion between wards in a single hospital may be helpful in illustrating differences between wards. The relative risk for a patient of being secluded on the respective ward is important for nurses to reflect on. This phenomenon may be related to the hospital's seclusion and restraint policy whether or not to concentrate seclusion in one or two wards in the hospital.

However, the relative risk cannot be calculated if all seclusion incidents take place on one specific crisis ward in a hospital. Another problem is that the relative risk reflects changes of the number of seclusions both on the ward under consideration and on the other wards in the hospital. This may be misleading: if the seclusion figures during a defined period of time on one ward are stable, while they increase on another, the relative risk decreases. Combining the relative risk with the absolute number of seclusion incidents, may provide in our experience a presentation of results in a clear and understandable way for mental health professionals working on these wards.

Patient level (third level).

On the patient level, figures on age, sex and diagnosis provide a deeper understanding in what groups of patients are exposed to a higher risk of being secluded in comparison to other patient groups in a hospital or on a ward. Again, ward policy may lead to differences. Our data confirm the findings of Martin et al. (2005), Martin, Bernhardsgruetter, Goebel et al. (2007), Betemps et al. (1993) and Way & Banks (1990) that, overall, patients diagnosed with schizophrenia are more likely to be exposed to seclusion. Also, we

observed patients with no axis one or axis two DSM-IV code yet to have more chance to be secluded.

These patients often had too short an admission to obtain any diagnosis.

The differences between wards were remarkable in this respect. Again, relative risk is a simple and understandable parameter to demonstrate these differences. Presenting the odds ratio when monitoring the wards, may provide as a warning sign since high odds ratios imply problems within a specific group of patients. Focused attention to this group by the team and management may help to decrease the use of seclusion.

Admission (second level) and intervention (first level).

Both levels provides the basic information. The information on admission level is useful to evaluate events during a single patient's admission. It can be used in weekly, monthly or other periodical evaluations. The information on intervention level is useful for controlling the registered coercive measures. It contains information on an individual level but is inappropriate for the use in hospital reports or scientific publications. It is, however, information that the Dutch Health Care Inspectorate considers highly relevant. Although from an individual patient rights perspective this may be seen as justified, as a tool for quality control, this is less the case. In line with Bowers (2000), we recommend using data covering a period of at least one year in order to calculate and report meaningful and comparable rates of incidents. Shorter periods are too sensitive for seasonal fluctuations and variations due to individual patients.

The comparisons between institutes and wards showed a great variability in the seclusion figures, with respect to the incidence ratios (incidents per 1000 admissions or per 100.000 inhabitants) as well as the prevalence ratios (days per 1000 occupied beds or hours per 1000 inpatient hours). Such calculations have not been done before and need further research into the origins of these differences.

5. Conclusion

Bowers (2000) argues that it is important to carefully consider which outcome helps best to answer the (research) questions being asked. We agree that no general solution is feasible. We add that it is important to combine analyses at a macro (hospital) as well as on a micro (the patient) level, because the micro levels are the drive to keep data accurate and valid for daily practice at the wards. With respect to our data, we suggest that different levels of analysis need different numerators and denominators. The distinctions made in this paper can assist researchers to choose methods and presentation of relevant findings carefully.

In the case of internal reports for a hospital or ward, absolute numbers, number of seclusion hours per 1000 inpatient hours, relative risk and odds ratio are helpful to evaluate patterns of the use of seclusion and restraint. For acute admission wards only, the number of incidents per 1000 admissions can be used for evaluation and internal comparison goals. For external reports and comparisons, figures on hospital level number of incidents per 100.000 inhabitants, number of seclusion or restraint days per 1000 occupied bed or, more precise, seclusion or restraint hours per 1000 inpatient hours are useful.

To compare the same types of wards between different hospitals, outcomes like seclusion days per 1000 occupied beds or seclusion hours per 1000 inpatient hours, or the relative risk and mean duration of seclusion and restraint per day or episode could be used. Data on the composition of the population of patients and the characteristics of secluded and restrained patients is helpful as background information to interpret the outcomes on the ward level.

Inclusion of such data in a single nationwide database provides the possibility for ward to learn from each the variety of coercive measures from different perspectives. Information on the admission level is primarily useful for individual evaluation goals and for quality control activities by the medical director or the inspectorate of health .

We propose to use the definitions, data and analysis techniques which we have presented, in further research and reports to evaluate results on seclusion and restraint use on different levels. Providing an overview of the rates of all coercive measures on all the levels mentioned enables a more specific understanding into the actual use of coercive measures. This approach can serve as a framework for comparisons between wards, hospitals and countries.

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