

Retrospective Study

Determinants of mechanical restraint in an acute psychiatric care unit

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Abstract**BACKGROUND**

Despite numerous attempts to reduce the use of mechanical restraint (MR), this technique continues to be widely applied in many acute psychiatric care settings. In order to reduce MR, a better understanding of the variables associated with its use and duration in different clinical environments is essential.

AIM

To determine the proportion of patients subjected to MR and the duration thereof in two acute care psychiatric units; and to identify the variables associated with the use and duration of MR.

METHODS

Descriptive study of all patients admitted to the acute psychiatric units at the Parc de Salut Mar (Barcelona, Spain) in the year 2018. The number and percentage of

this study was not necessary given the nature of the study.

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patients subjected to MR, as well as the duration of each episode were assessed. The following data were also registered: sociodemographic characteristics, psychiatric diagnosis, and presence of cultural and/or language barriers. Multivariate analyses were performed to assess determinants of MR and its duration.

RESULTS

Of the 464 patients, 119 (25.6%) required MR, with a median of 16.4 h per MR. Two factors - a diagnosis of psychotic disorder [Odds ratios (OR) = 0.22; 95% CI: 0.06-0.62; $P = 0.005$] and the presence of a language barrier (OR = 2.13; 95% CI: 1.2-3.7; $P = 0.007$) - were associated with a significantly higher risk of MR. Male sex was associated with a longer duration of MR ($B = -19.03$; 95% CI: -38.06-0.008; $P = 0.05$).

CONCLUSION

The presence of a language barrier and a psychotic disorder diagnosis are associated with a significantly higher risk of MR. Furthermore, male sex is associated with a longer duration of MR. Individualized restraint protocols that include the required tools are necessary to ultimately limit the use of mechanical restraint.

Key Words: Mechanical restraint; Prolonged restraint; Determining factors; Psychiatric acute unit

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Core Tip: The purpose of this descriptive study was to determine the proportion of patients subjected to mechanical restraint (MR) and the duration thereof in two acute care psychiatric units. Secondly, to identify the variables associated with the use and duration of MR. The most important highlights show that the MR remains frequent and with a median duration of more than 16 h. The diagnosis of psychotic disorder and the presence of a language barrier were associated with a significantly higher risk of MR. Furthermore, male sex was associated with a longer duration of MR.

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INTRODUCTION

Mechanical restraint (MR) is defined as the immobilization of a person through the application of mechanical devices that cannot be easily controlled or removed to prevent free movement of their body[1]. The use of MR in hospitalized psychiatric patients remains controversial, in part due to the numerous ethical, legal and clinical questions associated with this practice[2].

In clinical practice, MR is considered an emergency procedure for patients exhibiting potentially dangerous behaviour associated with psychiatric illnesses who have failed to respond to less restrictive interventions (principle of proportionality)[2, 3]. In addition to protecting the patient from himself, MR also serves to ensure the safety of healthcare personnel and others, and/or to prevent damage to buildings and physical objects[4]. The application of MR must be carefully considered given that it deprives the individual of their freedom[5] and is also often accompanied by mandatory drug restraint (medication administered against the explicit will of the patient)[6]. In this sense, MR has been associated with physical and psychological sequelae[3,7] in patients[8] and staff[9].

Many efforts have been made to reduce the use of MR and restrictive measures in general, as evidenced by the numerous legal, ethical, and clinical regulations and/or recommendations that have been developed[10,11]. Nevertheless, MR remains widely used in acute psychiatric care settings throughout Europe, although with marked international variation[12]. According to the European Evaluation of Coercion in Psychiatry and Harmonization of Best Clinical Practice[12], which evaluated and compared the use of restrictive measures in inpatient psychiatric centres in 10 European countries, the percentage of patients subjected to MR in those countries varied widely, ranging from 15% to 55% depending on the country (37% in Spain). This variability is highly influenced by legal, social, and cultural factors[13]. However, given that substantial variation has also been observed within countries, it seems clear that other factors play an important role in the use of MR[9]. The application of MR may also be influenced by variables related to the patient, the staff or the ward. According to some studies, the main determinants for MR are patient-related, including sociodemographic characteristics (age, sex, ethnicity, and employment, housing, and educational status)[14,15] or directly related to the mental disorder (*e.g.*, diagnosis, symptom severity, level of aggression, and recurrence of hospitalization) [15]. Nevertheless, there is some disagreement among these studies with regards to these determinants.

Few studies have evaluated the characteristics and determinants of the duration of MR episodes in psychiatry. Moreover, it is not known whether the reasons for the use of MR are related to the duration. In addition, epidemiological data show that the duration of MR varies greatly, ranging from 4.5 to 1182 h in one study[10].

The available data suggest that there are large differences in the proportion of patients subjected to MR and in the duration of restraint episodes, but the reasons for these discrepancies are still not clear. Given the consequences associated with the use of MR, it is essential to ascertain the underlying mechanisms that lead to MR and prolonged episodes, in order to develop strategies to minimize both the use and duration of MR.

In this context, the objective of the present study was to determine the proportion of patients subjected to mechanical restraint and the duration of these episodes in two acute psychiatric care units in our hospital system. We also aimed to identify the determinants of MR and their duration.

MATERIALS AND METHODS

This was a descriptive study involving a sample of patients admitted to two acute psychiatry hospitalization units (Hospital del Mar and the Dr. Emili Mira Center) at the Parc de Salut Mar (PSMar) in Barcelona from January 1, 2018 to December 31, 2018. The project was approved by the ethics committee at the PSMar (CEIC PSMAR).

Assessment

We determined the percentage of patients admitted to these centres in the year 2018 who were subjected to MR and the duration of these episodes. For the analysis, we considered only the first episode of MR. For patients readmitted during the study period, only the first admission was included.

The following cases were excluded from the analysis: abdominal MR in a bed or chair due to risk of falls, gait instability, or risk of removing life support systems. All data related to the MR episodes were consecutively registered, according to institutional restraint protocols, by staff members (nurses and/or psychiatrists), and incorporated into the patients' medical records. The date and time of day of the incident were recorded. However, some cases were registered several hours after the episode. Since the computer system does not permit any changes in the time or date, we reviewed the medical records of all restrained patients to verify the exact time and duration of the episode. During this review, we also determined whether a language barrier was present. Age, sex, psychiatric diagnoses, and place of birth at the time of restraint were obtained from the medical records. We checked the place of birth to differentiate between non-native and native-born patients in order to include this as a study variable (*i.e.*, potential cultural barrier). The diagnoses were recorded according to the ICD-10 classification and classified into four groups: (1) psychotic disorders (all types of schizophrenia, schizoaffective disorders, manic disorders, and bipolar disorders in manic phase); (2) depressive disorders (including bipolar disorders in depressive phase); (3) substance abuse disorders (SAD); and (4) other mental disorders (anxiety disorders, obsessive compulsive disorders, borderline personality disorders,

Alzheimer's, dementia, anorexia nervosa, among others).

Statistical analysis

Data were analyzed using the IBM-SPSS statistical software, v. 20.0 for Mac. The Kolmogorov-Smirnov test was applied to assess the distribution normality of the variables. Two variables - age and hours of restraint - were not normally distributed. Consequently, we performed a logarithmic transformation, but the distribution remained non-normal. Thus, the raw scores for these variables were used in subsequent analyses.

Univariate analyses were performed to assess differences between those patients who underwent MR and those who did not. The χ^2 test was used to compare the categorical data (sex, diagnosis, language barrier, and cultural barrier). The Mann-Whitney *U* test was performed to assess the role of age (non-normal distribution).

A binary logistic regression analysis was carried out using the "ENTER" method to examine the factors independently associated with MR. In this analysis, MR was the dependent variable and the independent variables were sex, age, diagnosis, and language barrier. For the multivariate analyses, we omitted the cultural barrier due to collinearity problems. The reference diagnostic group was "psychotic disorders".

Another univariate analysis was performed to determine the effect of the various study variables on hours of MR. Spearman's correlation was performed for quantitative variables, the Kruskal-Wallis test for categorical variables with more than one category, and the Mann-Whitney *U* test for categorical variables with two categories. Next, a multiple linear regression analysis was performed ("ENTER" method) to determine the variables independently associated with hours of restraint. In that analysis, the dependent variable was hours of restraint while the independent variables were sex, age, diagnosis, and language barrier.

RESULTS

A total of 474 patients were hospitalized during the study period. Of these, 129 required MR. Ten cases were excluded from the study because MR was applied due to the risk of falls or to start vital system support. Thus, the final sample consisted of 464 patients, 119 of whom were subjected to MR. The sample characteristics are described in [Table 1](#), together with the results of the univariate analysis for MR.

On the univariate analysis, the median age in the MR group was significantly lower than in the non-MR group: ($P = 0.005$; $Z = 2.80$). Patients with a language barrier ($P < 0.0001$; $\chi^2 = 15.06$) or cultural barrier ($P = 0.005$; $\chi^2 = 7.76$) were more likely to be physically restrained than native-born patients. Finally, the diagnostic category was significantly associated with the use of MR ($P < 0.0001$; $\chi^2 = 18.41$) ([Table 1](#)).

On the binary logistic regression, the presence of a language barrier was associated with a significant higher risk of MR [Odds ratio (OR) = 2.13; 95%CI: 1.2-3.7; $P = 0.007$] and the diagnosis was also a significant determinant of MR. Patients diagnosed with depressive disorder (OR = 0.22; 95%CI: 0.06-0.62; $P = 0.005$) and "other" diagnoses (OR = 0.46; 95%CI: 0.23- 0.93; $P = 0.03$) were significantly less likely to be subjected to MR compared to patients diagnosed with psychotic disorder ([Table 2](#)).

Hours of mechanical restraint

The median number of hours of restraint per episode was 16.4 (IQR: 7.98-29.27; $Z = 2.959$). The results of the univariate analysis for hours of MR are shown in [Table 3](#). The univariate analysis showed a significant association between sex and hours of restraint ($P = 0.004$; $Z = -2.856$).

On the multiple linear regression analysis, the only variable significantly associated with hours of restraint was sex, which was longer in men ($B = -19.03$; 95%CI: -38.06-0.008; $P = 0.05$; $f^2 = 0.03$) ([Table 4](#)).

DISCUSSION

The aim of the present study was to determine the proportion of patients subjected to MR and the duration of each episode at our institution during the year 2018. We also sought to identify the main factors associated with the use and duration of MR. During the study period, 25.6% of patients were subjected to MR, with a median duration of 16.4 hours per episode. After controlling for possible confounding factors, the determ-

Table 1 Demographic and clinical characteristics of the study sample according to use of mechanical restraint (univariate analysis), n (%)

	n (%)	Without MR	With MR	Z, χ^2	P value
Age (Median/IQR)	42 (30-53)	44 (31-56)	39 (28-48)	(Z) 2.801	0.005
Sex				1.124	0.289
Male	234 (50.4)	169 (72.2)	65 (27.8)		
Female	230 (49.6)	176 (76.5)	54 (23.5)		
Diagnosis				18.414	0.000
Psychotic disorder	318 (68.5)	219 (68.9)	99 (31.1)		
Depressive disorder	55 (11.9)	51 (92.7)	4 (7.3)		
SAD	21 (4.5)	16 (76.2)	5 (23.8)		
Others	70 (15.1)	59 (84.3)	11 (15.7)		
Language barrier				15.058	0.000
No	388 (83.6)	302 (77.8)	86 (22.2)		
Yes	76 (16.4)	43 (56.6)	33 (43.4)		
Cultural barrier				7.756	0.005
No	313 (67.5)	245 (78.3)	68 (21.7)		
Yes	151 (32.5)	100 (66.2)	51 (33.8)		

IQR: Interquartile range; SAD: Substance abuse disorders.

Table 2 Binary logistic regression analysis

	Beta	SE	P value	OR	95%CI for OR	
					Low	High
Age	-0.011	0.008	0.181	0.989	0.973	1.005
Sex	-0.032	0.229	0.889	0.969	0.619	1.516
Diagnosis			0.008			
Depressive disorder	-1.526	0.545	0.005	0.217	0.075	0.633
SAD	-0.427	0.535	0.425	0.652	0.229	1.861
Others	-0.776	0.358	0.030	0.460	0.228	0.928
Language barrier	0.758	0.281	0.007	2.133	1.229	3.702
Constant	-0.501	0.394	0.204	0.606		

OR: Odds ratio; SAD: Substance abuse disorders.

inants of MR were diagnosis (higher risk in patients with a diagnosis of psychotic disorder) and the presence of a language barrier. Furthermore, male gender was the only variable associated with prolonged MR. The proportion of patients who required MR - approximately one out of every four patients admitted to acute care - was similar to the rates reported in other studies, such as the 24% rate reported in a study carried out in Italy[12] and the 28.8% rate in another study in Spain[16]. However, studies conducted in other regions[10,17-20] have reported substantially lower rates of MR (from 1%-8%), probably because other methods (in addition to mechanical and pharmacological restraint) are used in those regions, such as isolation and, in some cases, the patient is allowed to select the restrictive measure. These differences may also be at least partially attributable to different cultural contexts and regulations governing hospitalization of psychiatric patients and the use of MR. Furthermore, given that high intra-country variability has also been observed in many studies, other

Table 3 Basic demographic and clinical characteristics of the study sample according to median hours of restraint (univariate analysis)

	n (%)	Restraint duration		Statistical	
		Median	IQR	Z, χ^2	P value
Age				(r) 0.027	0.768
Sex				(Z) - 2.856	0.004
Male	65 (54.6)	19.28	11.30-34.13		
Female	54 (45.4)	12.61	6.53-20.03		
Diagnosis				(χ^2) 6.488	0.090
Psychotic disorder	99 (83.2)	17.48	9.13-29.75		
Depressive disorder	4 (3.4)	5.05	2.92-7.86		
SAD	5 (4.2)	11.77	7.98-18.37		
Others	11 (9.2)	13.10	8.88-28.92		
Language barrier				(Z) - 0.819	0.413
No	86 (72.3)	15.68	7.98-29.27		
Yes	33 (27.7)	18.70	9.70-24.57		

IQR: Interquartile range; Z: Statistical value of U of Mann-Whitney; r: Spearman's statistical value; SAD: Substance abuse disorders.

Table 4 Multiple linear regression analysis

	B	SE	Beta	t	P value	95% CI for B	
						Low	High
Age	0.252	0.319	0.080	0.792	0.430	-0.379	0.884
Sex	-19.028	9.601	-0.214	-1.982	0.050	-38.063	0.008
Diagnosis							
Depressive disorder	-24.739	25.780	-0.101	-0.960	0.339	-75.850	26.372
SAD	-11.822	21.032	-0.054	-0.562	0.575	-53.520	29.875
Others	8.074	15.317	0.053	0.527	0.599	-22.294	38.442
Language barrier	-1.353	10.110	-0.014	-0.134	0.894	-21.397	18.691
Constant	30.248	20.105		1.505	0.135	-9.611	70.107

OR: Odds Ratio; SAD: Substance abuse disorders.

non-cultural factors, such as patient-related factors or the type of unit, may also help explain the differences.

After controlling for other variables, we found no association between age and MR. In line with our findings, several other studies have found no association between MR and age[20-23]; by contrast, several other studies have reported a significant association[9,13,17,24]. It is important to emphasize that most of the studies that found an association with age did not control for other variables (*e.g.*, diagnosis), whereas the studies that have reported no significant associations did control for other factors. Given that psychotic disorder is diagnosed more frequently in younger patients (relative to other diagnoses), we hypothesised that the key factor that determines the application of MR in younger patients could be the diagnosis rather than age.

Numerous studies have explored the influence of patient sex on MR, with most not finding any significant differences[15,18,21-23,25], in line with our findings. Nonetheless, some studies have reported an association between MR and male sex[17,20,24], although such findings may be due to the failure to control for other factors. In fact, the univariate analysis in two studies[21,22] revealed significant differences between men and women sex in terms of MR, but this difference was no longer significant after

controlling for other variables. This finding suggests that sex alone is not an independent predictor of MR, which may be more influenced by the psychiatric diagnosis or other variables.

In our study, the diagnosis was independently associated with MR. Specifically, patients diagnosed with a psychotic disorder had a significantly higher risk of MR, a finding that is consistent with multiple studies[12,17,22,26-28] and reviews[9,21]. That said, it is worth noting that several studies have not found any association between psychotic disorder and MR[13,23,29]. Different cultural contexts and the grouping of different psychiatric diagnoses in these studies could help to explain the discrepancies between those studies and ours.

Another factor associated with MR in our study was the presence of a language barrier. Although we initially differentiated between language and cultural barriers (due to the inclusion of non-native patients without a language barrier), we ultimately decided to omit the variable “cultural barrier” due to problems of collinearity, thus including only “language barrier” in the multivariate analysis. Other studies have found that being an immigrant (without specifying the presence of a language barrier or not) is a determinant of MR[25,30,31]. A study conducted in Spain in 2010 found that patients classified as immigrants had a significantly higher MR rate than paired Spanish-born hospitalized patients (81% *vs* 31%, respectively)[32]. In a study conducted in Italy, immigrant patients were more likely to require physical restraint than Italian-born patients[30]. A two-year retrospective analysis[25] found a 21.6% MR rate among patients with an immigration history compared with 12.9% of Norwegian-born patients. However, other studies have not found any differences between immigrants and native-born patients[33]. Communication problems derived from cultural and language differences between professionals and patients could lead to less successful interventions in risk situations.

The median duration of restraint in our study was 16.4 h, which is higher than some other studies[29,34]. This difference could be due the availability of other measures (*e.g.*, isolation) in those other studies/regions. Male sex was the only determining factor of restraint duration, a finding that is consistent with other reports[26,34]. Along these lines, it is worth highlighting a study carried out to assess the emotional reactions of staff to violent behaviour in psychiatric hospitalized patients. Interestingly, that study found that men and women provoked different reactions among staff members[35], suggesting that women may be perceived to be less threatening than men, which may partially explain why they are less likely to require prolonged MR.

Limitations

This study has several limitations. The first limitation is the retrospective study design, which did not allow us to explore certain key aspects. For example, we were unable to perform a more detailed clinical assessment of patients prior to and during the restraint period. Another limitation is that we assessed only acute psychiatric patients, who tend to have more severe symptoms, with more frequent and longer lasting episodes of MR. Consequently, the finding reported here may not apply to chronic psychiatric settings.

CONCLUSION

Despite efforts to reduce or eliminate the use of mechanical restraint, the results of this study show that these procedures remain widely used in the acute care units at our hospital. Two variables - a diagnosis of psychotic disorder and the presence of a language barrier - were associated with a greater risk of MR. In addition, male sex was associated with longer restraint periods. It is important to identify the patients most likely to require MR or those likely to require longer duration of MR in order to develop specific protocols to further reduce the use of MR.

ARTICLE HIGHLIGHTS

Research background

The use of mechanical restraint (MR) in hospitalized psychiatric patients remains controversial due to the numerous ethical, legal, and clinical questions associated with this practice. Many efforts have been made to reduce the use of MR. Nevertheless, it remains widely used in acute psychiatric care settings throughout Europe.

Research motivation

It's essential to identify the patients most likely to require MR or those likely to require a more prolonged duration of MR.

Research objectives

The main objective is to determine the proportion of patients subjected to MR and the duration thereof in two acute care psychiatric units. Secondly, to identify the variables associated with the use and duration of MR.

Research methods

Descriptive study of all patients admitted to the acute psychiatric units at the Parc de Salut Mar. The number and percentage of patients subjected to MR and the duration of each episode were assessed. Multivariate analyses were performed to evaluate the determinants of MR and its course.

Research results

The results show that the use of MR is very frequent. The diagnosis of psychotic disorder and the presence of a language barrier were associated with a greater risk of MR. The male sex was associated with longer restraint periods

Research conclusions

Despite efforts to reduce or eliminate the use of MR, the results of this study show that these procedures remain widely used in the acute care units at our hospital. Its determining factors are the psychotic disorder and the language barrier. The factors of a prolonged MR is the male sex.

Research perspectives

It is important to develop specific protocols to further reduce the use of MR.

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