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What affects musculoskeletal risk in nursing assistants and orderlies?

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What affects musculoskeletal risk in nursing assistants and orderlies?

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ABSTRACT

BACKGROUND: There are many musculoskeletal disorders in staff members at health centres, given the specific characteristics of their work.

OBJECTIVE: The objective was to analyse the postural risk of patient handling tasks performed by nursing assistants and orderlies, as well as task factors, individual or organisational, that may be associated with increased postural risk.

METHODOLOGY: This is a cross-sectional observational study. Analysis was done on 170 postures in five different tasks performed by 39 participants at three hospitals in Andalusia (Spain). The questionnaires collected sociodemographic variables, the task done, and REBA were used for assessment of postural risk.

RESULTS: Overall the average REBA score was 9.0±2.4. Moving the patient to the head of the bed was the task with the highest risk (9.8). Handling involving more than two participants at once increased postural risk. Using mechanical aids were associated with high risk in the legs. Logistic regression analyses showed that age, stature, and not having adjustable beds available were associated with postural risk ($p<0.05$).

CONCLUSIONS: Health centre staff perform many tasks with high musculoskeletal disorder risk. Age, stature of the participants, and adjustment of bed height were associated with postural risk.

Keywords: musculoskeletal disorder; healthcare worker; Rapid Entire Body Assessment; nursing staff; patient handling.

1. Introduction

Musculoskeletal Disorders (MSDs) are problems that commonly affect workers' health. They are defined as “injuries to connective tissues caused by sudden or continuous exposure to repetitive movements, efforts, vibrations, and bad postures” (1). In the case of MSDs originating at work, we can specify these in “alterations that these bodily structures undergo, fundamentally caused or aggravated by work and the effects from the environment in which this develops” (2).

International organisations such as EU-OSHA (European Agency for Safety and Health at Work) (3) point to these types of disorders as one of the main causes of work absenteeism across Europe, creating a clear reduction in companies' profitability and a large increase in social expenditures on health, accounting for 40% of economic expenditures for professional accidents and illnesses.

MSDs affect proportionally more women and increase with advancing age (4). In Spain and other surrounding countries, there is a large difference regarding gender distribution of nursing staff, with 83.6% being women and 16.4% men (5). Specifically, in the health care population at the Andalusian Healthcare Service (SAS, Servicio Andaluz de Salud) (6), there is a predominantly female population (74.2% women) and a high average age (men 51.8, and women, 50.4).

In many situations, MSDs are caused by constant exposure to loads over a long period of time, mainly affecting the upper limbs, shoulders, neck, and back. The main symptoms related to the pain caused by MSDs are swelling, partial loss of functioning in the affected area, as well as a decrease in strength (7).

The origin of MSDs is multifactorial. Many studies have shown that there are several associated factors: a) individual factors, such as sex, age, and body mass index (8–11); b) organizational and psychosocial factors, such as work experience, job requirements, autonomy, and shift work (12–14); c) physical and biomechanical factors, such as handling loads, repetitive movements; forced and static postures (15–17). The latest European survey of work conditions noted that 46% of workers had physical risks related to awkward postures during part of their work day (18). In addition to these factors, it is also necessary to emphasise the influence of psychosocial factors such as mental workload, work-related fatigue, work satisfaction, and social support, which are also factors with proven influence on these types of disorders (19–21).

More specifically, in the healthcare industry, different studies showed that a large percentage of workers complained of some type of musculoskeletal pain, this number ranged from 45% to 70% depending on the different countries (22–26). Among hospital staff, nurses report the highest prevalence of low back pain (LBP) (77.1%), with major work-related factors being standing for long time, carrying patients and lifting heavy objects (27). Among different nurse professions (including registered nurses, licensed practical nurses, and nursing assistants), nursing assistants have the highest prevalence of back injuries (28).

Many studies have investigated the risk factors of MSDs in healthcare workers and have shown that awkward postures (such as bending, twisting, lifting) are one of the relevant and modifiable factors (29–31). Thus, it is important to assess the postures and to explore the possible factors that influence their adoption of high-risk postures.

In reviewing the scientific literature, we can highlight that the REBA (Rapid Entire Body Assessment) method developed by Sue Hignett and Lynn McAtamney (32), is a semi-direct method to assess musculoskeletal risk based on the assessment of physical risk factors (33).

The REBA method has moderate to high reliability among researchers and has been used widely for posture assessment in the healthcare sector (34). There are two ways to collect data, observation in situ or observation of photos and videos (35). The advantages of REBA are its cost-effectiveness, very little training time needed if the observers are familiar with load handling and ergonomic postures and, principally, that the result determines the level of risk of a musculoskeletal injury, establishing the level of action required and the urgency of intervention (32).

The main objective of the research presented is to analyse the postural risk from patient handling tasks by nursing assistants and orderlies working in hospital centres using the REBA method. In addition to the above, the intent is also to analyse the factors in the task, individual or organisational, that most influence the level of postural risk so that preventive and corrective measures specific to this group can be developed.

2. Methodology

2.1 Participants and procedures

This cross-sectional observational study was conducted over a three-month period beginning in May 2019 in three services of three hospitals in a region of southern Spain.

The services have been selected by the management of the Andalusian Healthcare Service (SAS, Servicio Andaluz de Salud) because there is a greater number of elderly ill people in beds, resulting in more complex and costly manual handling tasks for the professionals involved.

The people responsible for each service provided a list of potential individuals who could participate in the study, depending on whether they met the following criteria: Professional category: nursing assistant and/or orderlies; performing tasks related to handling patients among their primary duties, being in paid service at the time of the study, and being on duty when data were collected at their centres. Exclusion criteria: Being on leave from their job, not during their work hours, or on vacation at the time of the study.

The total number of nursing assistants or orderlies was 60 (Internal Medicine 27 + Neurosurgery 18 + Neurology 15), according to information from the occupational risk prevention service at the health centres. Of these, 40 people met all the criteria. Nine did not meet the criteria as they did not perform patient handling among their usual tasks, and 11 were not working when the data were collected. All of them were offered the chance to participate in the study, for which an information sheet and informed consent were provided through their immediate managers (a supervisor in the case of nursing assistants, and the services director in the case of orderlies). The number of people who agreed to participate was 39, resulting in a response rate of 97.5%.

2.2 Instruments and variables

Sociodemographic characteristics questionnaire

The questionnaire included questions related to sociodemographic variables: age (30 to 41, 42 to 53, and 54 to

65 years), stature (cm), weight (kg), professional category (nursing assistant/orderly), working experience (year/s), service unit in which the work is performed (Internal Medicine, Neurology, and Neurosurgery). The body mass index of the participants was calculated and categorized according to the definition from the National Institutes of Health (NIH) and the World Health Organization (WHO) (36).

Questionnaire on variables of the task performed

Task performance variables included several contextual elements as well as the REBA assessment tool. These were: the type of task performed (moving towards the head of the bed, washing patients, changing postures, transfer from bed to chair/wheelchair, and transfer from chair/wheelchair to bed); the number of workers performing the task at the same time (2/3/4); the availability of height-adjustable beds, since not all rooms had adjustable beds (Yes/No); and the use of mechanical aids, including patient lifts and sit-to-stand patient transfer (Yes/No). Mechanical aids were used for patients who could not cooperate with the participants, or obese patients or patients who had special injuries that could not be mobilized manually. The participants decided whether to use the mechanical aid, according to the needs and the workspace.

REBA assessment worksheet

The dependent variable in the study is postural risk, the instrument to measure this was the Rapid Entire Body Assessment (REBA) observational method.

On the REBA worksheet, we recorded and analysed the postures of the upper limbs, trunk, neck, and lower extremities. We also distinguished the type of grip and identified the existence of brisk changes in posture or unstable postures.

In accordance with the calculation rules stipulated by this method (32), the score was obtained from the data collected for Group A (neck, trunk, and legs, 1-12) and Group B (arms, forearms, and wrists, 1-12). Scores A and B were combined to give the final REBA score (1-15), with 8 to 10 considered to be high risk scores and from 11 to 15 as very high. The REBA score was used as a continuous variable for association analyses. For regression analysis, the classification of risk levels was performed according to the criteria established in the REBA method (32) as shown in Table 1.

2.3 Data collection

First, the sociodemographic characteristics questionnaire was distributed on paper to all participants. After completing the questionnaire, three researchers who are experts in ergonomics collected data based on in-situ observation and video recording.

The process was carried out while the participants did their normal work, so the type of task, time and duration of observation were not predefined. These depended on how long the participant spent on the task.

Before beginning the observation, researchers asked the participant what task they were going to perform, then the patient or family members were contacted for their consent, and after this the researchers entered the room with the participant, staying until the task was finished.

All three researchers who were trained in the REBA method participated in each evaluation. One of the researchers used a wide-angle sports camera to record the whole process and ensured that all participants performing the task were recorded. The other two researchers collected the data through direct observation on the assessment worksheet. When the task was performed by two participants, each researcher filled out the REBA for one of them. In the case of three or four participants handling the patient at the same time, participants close to the head of the bed were assessed first, through in situ observation. Since the postures of participants near the end of the bed can be clearly recorded, those assessments were carried out subsequently through observation of videos.

The same participant was evaluated more than once, the type of task depended on their work content and the needs of the patient.

During the observation and evaluation process, researchers did not alter the participant's workspace. In all cases, an interjudge validation was subsequently done; the two researchers who collected the data exchanged the assessment worksheets they filled out and then, independently, checked each other's worksheets while watching the video. In the event of a discrepancy, the three researchers viewed the videos together until agreement was reached.

2.4 Data analysis

The computerized statistical package SPSS 25.0 (SPSS Inc., Chicago, IL, USA) was used to analyse the results.

First, the Kolmogorov-Smirnov normality test was done to verify distribution of the data. Second, whether a relationship exists between adopting a postural risk and the different independent variables was analysed through Spearman's correlation analysis and nonparametric tests ("Kruskal-Wallis for K independent groups" and "Mann-Whitney U for two independent groups"). Finally, logistic regression analysis was done with those variables having a p-value <0.05 in the previous analysis. Odds ratios (OR) were calculated to determine the contribution from risk factors. For all tests, when the *p*-value is <0.05, it is considered statistically significant.

2.5. Ethical approval

The study was conducted in accordance with the Declaration of Helsinki and approval was obtained from the Research Ethics Committee of Andalusia (REC of the Virgen Macarena-Virgen del Rocio university hospitals: d9b449426c41062448a2d8be713a0b063741ae96) prior to carrying out the study. In all cases, participants signed an informed consent form before participating. Similarly, before starting each evaluation, the patient's written authorization was obtained, which clarified that the patient should not be identified in any audio-visual materials. If the patient was not in full possession of their mental faculties, the written authorization of their family members was obtained.

3. Results

3.1 The sociodemographic characteristics

The sociodemographic characteristics of the participants are shown in Table 2. Of the 39 participants, there were 7 men (17.9%) and 32 women (82.1%). The average age was 50.4 years (SD±7.6); higher in men (51.7±6.8 years) than women (50.1 ± 7.8 years), although the differences were not significant. The majority (n=30) of participants were nursing assistants and nine were orderlies. Average time in the current position or a similar one for the purpose of manual patient handling was 15.4±8.4 years, the men on average worked for less time in the position (15.0±12.0 years) than the women (15.5±7.6 years). Over half (51.3%) were employed by the Internal Medicine Service; 28.2% by the Neurosurgery Service; and 20.5% by the Neurology Service.

3.2 Musculoskeletal risk of the postures assessed

A total of 170 work postures assessments in five different tasks were obtained. A total of 142 observations were conducted in situ, and 28 were conducted via video recording. Each participant was involved in at least 2 and up to 5 postural assessments. Seventeen participants were involved in 2 assessments, 8 participants were involved in 3 assessments, 12 participants were involved in 4 assessments, and 2 participants were involved in 5 assessments. After calculating the final REBA score, 40 postures (23.5%) had a medium level of musculoskeletal risk, 74 postures (43.5%) had a high level of musculoskeletal risk and 56 postures (32.9%) were at a very high level of risk. According to the recommendation established by the REBA method (Table 1), 76.4% of the postures analysed belonged to the high / very high level, which required timely action.

The results showed an average REBA final score of 9.0±2.4 (1-15). The average Group A score was 8.1±2.3 (1-12), and the average Group B score was 4.6±1.8 (1-12). A final score of 9 implied a high level of musculoskeletal risk, according to the classification provided by the REBA method (Table 1).

3.3 Factors associated with musculoskeletal risk

Age was an important risk factor based on the analysis of sociodemographic variables (Table 2). There was a significant difference in REBA scores among the three age groups (K=12.02; p=0.002*). The average REBA final score was higher in the 54 to 64 age group (9.7) than in the 42 to 53 age group (8.3) and 30 to 41 age group (9.3), although all three groups scored in the high-risk range.

About body mass index, there were significant differences in the scores in the four BMI categories. (*K*=9.32; *p*=0.025*). Although the REBA scores of all categories were in the high-risk range, the higher the average score, the greater the risk. The average REBA final score of those with obesity problems was 9.7, which was higher than the scores of the other three BMI categories.

The REBA score was positively related to the stature of the personnel when the height of the bed was not adjustable (Spearman's rank correlation coefficient=0.48; *p*=0.004*). Taller participants' REBA scores were higher when the bed height cannot be adjusted correctly. However, this relationship was not found in cases where bed height was adjustable (Spearman's rank correlation coefficient=0.03; *p*=0.840).

The stature difference among participants within the group was calculated, which was equal to the stature of the tallest group member minus the stature of the shortest member (for example, in a group of four people with heights of 150cm, 160cm, 165cm, and 170cm, the difference in stature will be 170cm-150cm=20cm). For correlation analysis, we explored the correlation between the stature difference within the group and the average score on the REBA assessment of all the group members.

According to Spearman's rank correlation analysis, there was a high positive correlation between the average of the final score and the difference in stature between groups. The posture when performing the tasks worsens as the difference in stature between individuals increases (Spearman's rank correlation coefficient=0.62; *p*=0.002*) (Table 2).

Other sociodemographic variables analysed (working experience, professional category, and service unit they belong to) did not show significant differences (Table 2).

As shown in Table 3, there was a significant association (*K*=13.73; *p*=0.008*) between the REBA results and the tasks performed by the participants. Of the 170 postures assessed, 17

(10.0%) were moving patients towards the head of bed, 16 (9.4%) of them were washing patients, 46 (27.1%) were changing postures, 80 (47.1%) were moving patients from bed to chair/wheelchair, and 11 (6.5%) were moving from chair/wheelchair to bed. The task containing the greatest postural risk were moving the patient to the head of the bed (average REBA score of 9.8) and the move from a bed to a chair or wheelchair (average REBA score of 9.5).

For manual patient handling tasks, the most common was a group of two workers, that is, either a group of the same professional category or a nursing assistant working with an orderly. A total of 101 postures assessments (59.4% of the total) were done when two participants worked together; 35 postures (20.6% of the total) done by three, and 34 postures (20.0% of the total) done by four participants. The results showed that when the patient was handled by four participants at the same time, there was a higher postural risk for each of them. However, when the patient was moved by two participants, the postural risks for both were lower (K=9.34; p=0.009*).

Special attention was paid to the use of mechanical aids. Of the total tasks assessed, mechanical support was used in 50 of them (29.4%). Although the overall REBA score was higher in those tasks with mechanical aids, the difference was not significant (p=0.073) (Table 3). However, it should be noted that the participants adopted worse leg postures (Table 4), with significant differences (Z=-3.48; p=0.001*).

Logistic regression was used to assess the effects on the postural risk level of the participants. Five independent variables (or predictors) with significant results (p<0.5) had been introduced into the model: age, stature, body mass index, type of task performed, and availability of adjustable beds. Among these variables, the ones that were statistically significant were age, stature, and availability of adjustable beds. The final logistic model was able to explain the 42.2% variation (Nagelkerke R-squared) in the adoption of a posture of high/very high level of risk and was able to correctly classify 82.8% of the samples (χ^2 (4) = 39.8, p=0.001*). Participants over the age of 51 were 12.4 times more at risk than those under the age of 51 (OR=12.4, p=0.001*). When adjustable beds were not available, the risk was 8.6 times higher than that of adjustable beds. (OR=8.6, p=001*). Lastly, when there were no adjustable beds, taking the participant with the lowest height as a reference, the risk increased by 11.5% for each additional centimetre of individual stature (OR=1.115 , p=0.014*) (Table 5).

4. Discussion

Our research joins others that have reported a high postural risk among healthcare workers, specifically in nursing assistants and orderlies (37–39).

This fact is mainly caused by the large amount of manual handling they do, but it is also necessary to bear in mind that the average age was quite high in this group. The WHO's "State of the World's Nursing 2020" report highlights that, according to statistics from 106 countries/regions, nearly one fifth of the professionals are over 55 years of age (40). The aging of professional nursing staff has become a global problem, and the increase in age is clearly linked to greater musculoskeletal risk (41).

When we analysed specifically each one of the tasks, we found that moving the patient towards the head of the bed entailed higher risk, a fact that aligns with research done by Claus Jordan's team (42). Through biomechanical analysis with the DOLLY 3 device, specially developed to quantify the lumbar load index, it was found that the highest lumbar load was reached when the patient was moved toward the head of the bed.

Another variable relevant was the relationship between the workers´ stature and adjustment of the bed heights. Logically, the professionals need to adjust the height of the bed according to their stature to handle patients more comfortably. This finding concurs with previous studies that highlight the importance of adjusting the beds, which allowed the professional to handle the patient at a correct height (43,44). Additionally, some studies indicated that the use of a so-called “smart bed” is clearly associated with a decrease in the physical load (45).

Another result of the research worth noting is the number of participants who handle a patient at the same time and the difference in stature among them. We found that a team of two people with similar stature is much better than a multi-person team with a large difference in stature. This finding is consistent with the Patient Handling and Mobility Assessments white paper (46). This white paper classifies as one of the high-risk manual patient handling tasks when several team members handle a patient, and the bed height is impossible to be appropriate for each team member. Although there is no specific guidance on this in the mentioned report, it is recommended that this factor be considered when assigning team members.

It should also be noted that mechanical aids, namely electromechanical lifting equipment such as patient lifts and sit-to-stand patient transfer, were not always very positive in reducing risk and can also cause knee problems. When using patient lifts, the participants blocked the wheels with their foot to stabilize the machine, while supporting the patient with their hands. When using sit-to-stand patient transfer, the participant needed to squat several times to place the patient's foot in the correct position. These awkward postures resulted in high REBA scores. Although these devices can obviously reduce the load of patient handling tasks, it does not mean that they are free from postural risks. This is inconsistent with some studies that showed that mechanical aids were associated with low musculoskeletal risk (29,47). The different findings may be due to one of three reasons. One is that the research focuses are different. Previous studies focused on the availability and frequency of use of mechanical aids, but we studied the postures adopted when using such devices. Another reason may be the difference in the types of mechanical aids. The study of Lee et al. (48) has shown that nurses using ceiling lifts reported fewer MSDs symptoms than nurses with only floor lifts. Finally, it is difficult to confirm whether mechanical aids can reduce musculoskeletal risks given that many variables can affect the effects of mechanical aids, such as the condition of the environment, state of the patient, and a lack of time that can cause incorrect usage, which in the end can be more damaging (49). In general, the effect of the use of assistive devices is still uncertain (50–52).

As shown in the logistic regression analysis, there is a relationship between their working posture and age, the availability of adjustable beds, and the stature of the participant. These findings are in line with other publications carried out on healthcare personnel (53–55).

5. CONCLUSIONS

Results of the study clearly show that the handling of patients in health care centres involves many tasks with high musculoskeletal risk. The final REBA score of the postures collected in this study shows that 76.4% of them were at a high (8-10)/very high musculoskeletal risk level (11-15), which shows the urgency of taking preventive and corrective actions for these professionals.

From the analysis of the different tasks, it can be concluded that moving the patient to the head of the bed is the one that poses the greatest risk. This fact should be taken into account to schedule this task among several trained professionals in order to minimise exposure to this risk.

It is also important to take the personal characteristics, such as age and stature, into account. Groups should be assigned reasonably, trying to group those of similar stature into a group and reducing the time that older employees are exposed to tasks having high risk. Two other variables to consider in the work groups are the number of professionals working together and their stature difference. It is preferable to have two professionals working together rather than to have more than two workers. When performing patient handling tasks, it is recommended that workers of similar stature form a group.

In regard to mechanical aids or supports, we must emphasize the importance of introducing adjustable beds, so that workers can adjust the bed height according to their stature. In hospitals that do not have adjustable beds, the bed height is usually designed to be short for the safety of patients; this means a higher postural risk for taller workers. Nevertheless, mechanical aids do not always have a positive effect. In fact, when using them, many of these participants shift the problem to the lower extremities, so it is recommended that all workers, especially those with knee problems, receive proper training before using these mechanical aids. Given the significant results found, these should be passed on to the supervisors or management at all the centres so they can take the results into account when coordinating human resources and training workers.

Thus, in-depth research needs to be done on the variables associated with degree of risk, carrying out ergonomic interventions and diverse improvement plans to optimise working conditions and help eliminate or reduce the impact of poor posture on health, thus promoting the health and well-being of this group.

Limitations of the study

This research has yielded some interesting results that are worth exploring, especially as they can be designed in practice.

Nevertheless, interpretation of these results should be cautious and some limitations must be taken into account:

- Sample selection. The hospitals and units were selected by the Andalusian Healthcare Service (SAS, Servicio Andaluz de Salud) because the tasks of handling patients in these units are more complex than in other units. However, other geographic areas and hospital services should be explored.
- Although the response rate is high, those who responded to the questionnaire may not be a truly random sample.
- The limitations of data analysis. Like most quantitative cross-sectional studies, we can obtain the correlation between variables through the data, but the data cannot explain the results themselves. That is to say, we can infer conclusions but, nevertheless, causality cannot be obtained directly through the data.
- The time limitation. The data collection in this study was carried out in a short period of time. It could be supplemented by a longitudinal-type study in the future.

Ethical approval: The study was conducted in accordance with the Declaration of Helsinki, and approved by the Andalusian Research Ethics Committee (REC of the Virgen

Macarena-Virgen del Rocio university hospitals: d9b449426c41062448a2d8be713a0b063741ae96).

Informed consent: Informed consent was obtained from all subjects involved in the study.

Conflict of interest: The authors declare no conflict of interest.

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LIST OF TABLES

Table 1

Classification of risk level based on REBA Method and the results obtained in this study

REBA score	N	Percentage (%)	Risk level
1	0	0	Negligible
2 - 3	0	0	Low
4 - 7	40	23.5%	Medium
8 - 10	74	43.5%	High
11 - 15	56	32.9%	Very high
Total	170	100%	

Note. The classification of risk levels was performed according to the criteria established in the REBA method (32)

Table 2

Sociodemographic characteristics of the participants and the association with REBA

Variable	Classification	N (%)	REBA score (SD)	*p*-value
Gender	Female	32 (82.1)	8.7 (2.4)	0.648
	Male	7 (17.9)	8.7 (2.4)	
Age groups	30-41	5 (12.8)	9.3 (3.0)	0.002*
	42-53	14 (35.9)	8.1 (2.4)	
	54-65	20 (51.3)	9.7 (1.8)	
BMI (kg/m^2)	Underweight	2 (5.1)	8.7 (2.4)	0.025*
	Normal weight	23 (59.0)	8.8 (2.5)	
	Overweight	10 (25.6)	8.7 (2.4)	
	Obese	4 (10.3)	9.1 (2.3)	
Professional category	Nursing assistants	30 (76.9)	8.7 (2.4)	0.394
	Orderlies	9 (23.1)	9.1 (2.5)	
Service Unit	Internal Medicine	20 (51.3)	8.7 (2.4)	0.170
	Neurosurgery	11 (28.2)	8.7 (2.5)	
	Neurology	8 (20.5)	8.9 (2.6)	

Variable		Mean (SD)	Spearman's rank correlation coefficient	*p*-value
Stature (cm)	Bed height is not adjustable	163.2 (9.1)	0.371	0.004†
	Adjustable bed height		0.028	0.840
Working experience at SAS (years)		16.1 (7.5)	-0.002	0.980
Working experience in current and similar position (years)		15.4 (8.4)	0.169	0.129
Difference in stature (H_{max}-H_{min}, cm)		5.9 (5.4)	0.620	0.002†

* Kruskal Wallis Test.

†Spearman's rank correlation

Table 3

Characteristics related to task performed and the association with REBA

Variable		N (%)	REBA score (SD)	*p*-value
Type of task performed	Moving towards the head of bed	17 (10.0)	9.8 (2.6)	0.008*
	Washing patients	16 (9.4)	7.7 (2.6)	
	Changing postures	46 (27.1)	8.6 (2.7)	
	Bed to chair/wheelchair	80 (47.1)	9.5 (1.9)	
	Chair/wheelchair to bed	11 (6.5)	7.6 (2.9)	
Use of mechanical aids	YES	50 (29.4)	9.5 (2.2)	0.073
	NO	120 (70.6)	8.8 (2.5)	
Availability of height-adjustable beds	YES	110 (64.7)	8.7 (2.6)	0.091
	NO	60 (35.3)	9.6 (1.9)	
Number of workers performing the task at the same time	2	101 (59.4)	8.6 (2.6)	0.009*
	3	35 (20.6)	9.1 (2.2)	
	4	34 (20.0)	10.2 (1.7)	

* Kruskal Wallis Test

Table 4

Associations between the use of mechanical aids and the REBA scores of different parts of the body

Use of mechanical aids	REBA mean scores of different parts of the body (SD) †					
	Trunk	Neck	Legs	Upper arms	Lower arms	Wrists
Yes	3.2 (1.1)	2.0 (0.6)	2.2 (1.0)	2.7 (0.9)	1.1 (0.3)	2.2 (0.9)
No	3.7 (0.7)	2.2 (0.7)	1.5 (0.6)	2.6 (0.8)	1.2 (0.4)	2.0 (0.7)
p-value	0.057	0.363	0.001*	0.804	0.290	0.379

* Mann-Whitney Test.

†Score range: Trunk (1-5), Neck (1-3), Legs (1-4), Upper arms (1-6), Lower arms (1-2), Wrists (1-3)

Table 5

Results of final regression model for postural risk

	OR	95% Confidence interval		*p*-value
		Lower	Upper	
Age groups	12.397	2.94	52.21	0.001*
Availability of height-adjustable beds	8.597	2.50	29.55	0.001*
Stature (cm)	1.115	1.02	1.22	0.014†

* p<0.01; † p<0.05; OR=Odds Radio