Scientific
Research
Publishing

The Effectiveness of the Lateral Patient Transfer Device to Reduce Musculoskeletal Risk among Practical Nurses in a Hospital, Thailand

Parvena Meepradit, Kanjana Panyadee, Tanongsak Yingratanasuk

Department of Industrial Hygiene and Safety, Faculty of Public Health, Burapha University, Saen Suk, Chonburi, Thailand
Email: pravena15@yahoo.com

Abstract

Moving patients is a task that requires force, and poses musculoskeletal risk among practical nurses. The use of an equipment to assist patient lifting and transferring can reduce musculoskeletal risk. This study was a quasi-experimental research measuring the effectiveness of a patient moving device for a period of 4 weeks among practical nurses in a hospital. The 33 subjects were selected based on the inclusion criteria. The data were collected by using the rapid upper limb assessment (RULA) tool. The results showed that the patient moving device could reduce musculoskeletal risk which included the work posture significantly (P < 0.05). This study could be used as a practical basis for hospital to bring in the equipment for assisting moving of patients.

Keywords

Lateral Transfer of Patient, Practical Nurse

1. Introduction

The shortage of nursing staff in Thailand is a national problem that has been continuing for decades. It is due to the change in the population structure, the increase of the elderly population and chronic diseases [1]. This change has brought more patients to hospitals. There has also been a restriction on employment of professional nurse [2]. The practical nurses or nurse assistants play an important role in caring of the patients in hospitals. The most common activities for patient care are keeping the patient clean, wiping to reduce fever, pre-

paring and feeding food, helping patients in defecation, urination and cleansing, and moving and distributing patients from the ward. This includes supporting patient transfer while in bed, wheelchair, and toilet seat [3].

A preliminary study of the risk factors for musculoskeletal disorders of nursing assistants in an eastern Private Hospital found that the high risk activities including patient support, changing posture or positioning patients in beds, and moving patients from a wheelchair or to a wheelchair. The OR were 3.97, 3.82, and 3.73 respectively [4]. A recent result of the hospital case study found that the most activities of practical nurses were frequent transfer of patients, and the changing posture or position of the patients. Nursing assistants had to transfer and help changing posture of the patients at an average of 15 and 6 times per day, respectively.

Patients handling continues to represent a high risk of low back pain (LBP) among health care providers. A study that employed the 3-D images showed spine forces imposed upon the lumbar spine when 10 subjects manipulated ceiling-based and floor-based patient lifts through various patient handling conditions and maneuvers. The results indicated that ceiling-mounted patient lift systems imposed spine forces upon the lumbar spine that would be considered safe, whereas floor-based patient handling systems had the potential to increase anterior/posterior shear forces to unacceptable levels during patient handling manoeuvres [5].

Patient transfer devices are considered a potential intervention; however, few biomechanical analyses had investigated the spine loads and LBP risk associated with these transfer devices [5]. The Nelson's study found that the use of patient mobility equipment to wheelchairs and beds, and biomechanical improvements was a significant reduction in post-traumatic injury (P < 0.001) [6].

Based on the above information, the researchers had designed a sliding device to use with the original patients moving board. The main objective of this study was to determine the effectiveness of the device for reducing musculoskeletal risk by using the RULA (rapid upper limb assessment) score.

2. Materials and Methods

A quasi-experimental study took place in a hospital in the Chonburi province of Thailand. The 33 female practical nurses were selected based on the inclusion criteria, including no history of Gout or the other related to musculoskeletal diseases and no history of spine surgery.

The data were collected in terms of the Rapid Upper Limb Assessment (RULA) worksheet [7]. The requirement of actions was based on the grand scores divided into levels as follows:

Action level 1: A score of 1 or 2 indicated that posture was acceptable if it was not maintained t0 repeated for long periods.

Action level 2: A score of 3 or 4 indicated that further investigation was needed and changes might be required.

Action level 3: A score of 5 or 6 indicated that investigation and changes were required soon.

Action level 4: A score of 7 indicated that investigation and changes were required immediately.

2.1. Development of the lateral Patient Transfer Device

1) The design of the dimensions of the device used the standard anthropometric data of the shoulder length of the Thai women which was 40.5 cm [8] and the size of the working station with details as shown in **Figure 1**.

2) Nylon was selected for the material of the sheet and the pulling rope based on its durability and low friction coefficient [9]. The ropes were attached to the sheet with handles at the end of the ropes as shown in **Figure 2**.

3) The device was tested with the nurse assistants. A problem was found in that the ropes were too long and the nylon sheet was too large. Therefore, we decreased the length of the ropes and the size of the sheet. In addition, we also stitched the corners of the sheet as shown in **Figure 3**.

4) The device was used by the practical nurses for transferring patients for a period of 4 weeks.

2.2. Ethical Considerations

The study protocol was approved by the Ethics Committee of the Faculty of Public Health, Burapha University. Subject participation in this study was on a voluntary basis: every respondent gave a copy of the informed consent. As for the assurance of privacy and confidentiality, the information was kept in a locked cabinet and destroyed after the study was over.

3. Results

The 33 women practical nurses had an average age of 39.09 years old (S.D.12.06 years). The majority was obese based on the body mass index (57.6%). Approximately 84.9% of the participants completed at least secondary school. The
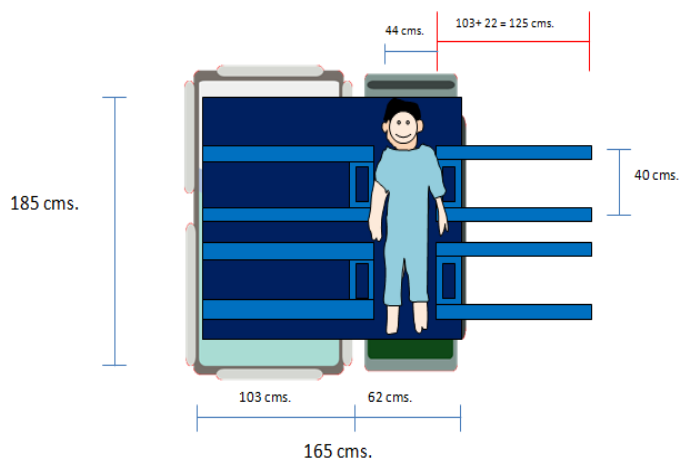

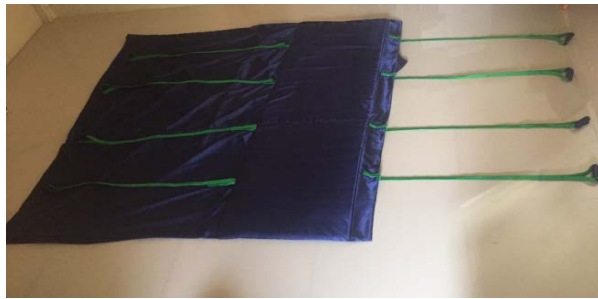**Figure 1.** Design of the lateral patient transfer device.

Figure 2. The lateral patient transfer device first version.

Figure 3. The lateral patient transfer device last version.

results of the study indicated that the most common cause of musculoskeletal pain was patient transfer (48.5%), followed by patient lifting, patient wiping, and lifting objects (15.1%, 9.1%, and 9.1%, respectively).

The results of RULA score before using the device was 7 on both left and right sides, as shown in **Figure 4**. It was indicated the action level of 4 meaning investigation and changes were required immediately as shown in **Table 1**.

The result of the risk assessment of working posture while moving patients after using the device was shown in **Figure 5**. It was found that the majority of the RULA scores were 4 - 6 on both left and right sides. It was indicated that the action level of 2 or 3 meaning investigation and changes might be required soon as shown in **Table 2**.

The comparative results of the RULA scores between before and after using the device indicated that the majority of working posture risk decreased from 7 to 6 (66.67%), followed by 5 (30.30%), and 4 (3.03%), respectively. The average score before using the device was 7.00 (SD = 0.000) and after was 5.64 (SD = 0.096) (P < 0.05).

4. Discussions

The results of the risk assessment of working posture while moving patients before using the transfer device showed that the RULA score was 7. The results were consistent with that of Sasigala and Paseillas who found that moving of patients was a high risk task [10]. In contrast, the risk after using the lateral patient transfer device was lower. The highest RULA score of 6 and the lowest score of 4 were significantly different (P < 0.05). This may be due to the fact that the device

Figure 4. The working postures while moving patients by the practical nurses before using the designed patient transfer device.
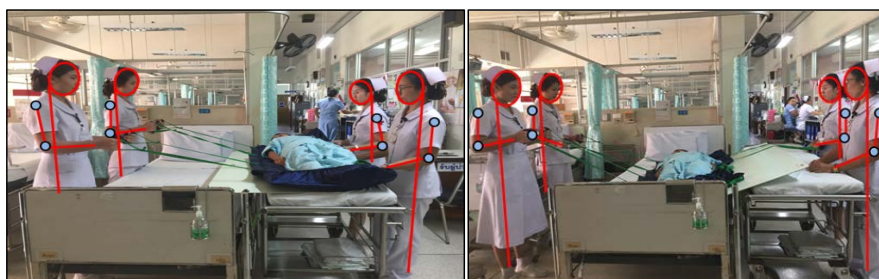

Figure 5. The working posture while moving patients by the practical nurses after using the transfer device.

Table 1. The results of RULA score before using the transfer device.

Working posture assessment		Score	
		Left side	Right side
Group A. Scoring posture of the body part which included the upper arm, the lower arm, and the wrist.			
1.	The range of upper arm movement	5	5
2.	The range of lower arm movement	2	2
3.	The position of wrist	2	2
4.	The pronation and supination of wrist	1	1
5.	The summary score for upper arm, lower arm and wrist	6	6
6.	Muscle usage	0	0
7.	Force	3	3
8.	Score A.	9	9
Group B. Scoring the posture of the neck, trunk, and legs.			
9.	The range of neck movement	4	4
10.	The range of trunk movement	4	4
11.	The position of legs	1	1
12.	The summary score for neck, trunk, and legs	7	7
13.	Muscle usage	0	0
14.	Force	3	3
15.	Score B.	10	10
	Final score (Score C.)	**7**	**7**

Table 2. The results of RULA score after using the transfer device.

| Working posture assessment | Score | | | |
| | Left side | | Right side | |
	Maximun	Minimum	Maximun	Minimum
Group A. Scoring posture of the body part which included the upper arm, the lower arm, and the wrist.				
1. The range of upper arm movement	1	1	1	1
2. The range of lower arm movement	1	2	1	2
3. The position of wrist	1	2	1	2
4. The pronation and supination of wrist	1	1	1	1
5. The summary score for upper arm, lower arm and wrist	1	2	1	2
6. Muscle usage	0	0	0	0
7. Force	3	3	3	3
8. Score A.	4	5	4	5
9. The range of neck movement	1	3	1	3
10. The range of trunk movement	1	1	1	1
11. The position of legs	1	2	1	2
12. The summary score for neck, trunk, and legs	1	3	1	3
13. Muscle usage	0	0	0	0
14. Force	3	3	3	3
15. Score B.	4	6	4	6
Final score (Score C.)	4	6	4	6

has helped adjusting the working posture while moving patients. In addition, the positions of the upper arm, the lower arm, the wrist, the neck, and the trunk were improved. However, the device did not help adjusting the posture of the legs because the length of the pulling ropes could not be altered and the working area was limited. The pulling ropes provided power grip. Future study is recommended to improve the design of the rope for the device.

References

[1] Srisuphan W. and Sawaengdee, K. (2012) Recommended Policy-Based Solutions to Shortage of Registered Nurses in Thailand. *Thai Journal of Nursing Council*, **227**, 5-12.

[2] Kantha, A. (2014) The Impacts and Solutions to Nursing Workforce Shortage in Thailand. *Journal of Nursing Science*, **32**, 81-90.

[3] Ministry of Public Health (2010) Regulation of Ministry of Public Health Defined the Controlling of Nursing Profession to the Person Who Helped the Patient in the Hospital.

[4] Sudsupan, S., Chantawong, C. and Lankanvas, Y. (2014) Risk Factors of Musculoskeletal Disorders on Practical Nurse in Private Hospital, Eastern Region. [Online]. http://ohnde.buu.ac.th

[5] Marras, W.S., Knapik, G.G. and Ferguson, S. (2009) Lumbar Spine Forces during Manoeuvring of Ceiling-Based and Floor-Based Patient Transfer Devices. *Journal Ergonomics*, **52**, 384-397. https://doi.org/10.1080/00140130802376075

[6] Naidoo, R. and Coopoo, Y. (2007) The Health and Fitness Profiles of Nurses in KwaZulu-Natal. *Curationis*, **30**, 66-73. https://doi.org/10.4102/curationis.v30i2.1076

[7] McAtamney, L. and Corlett, E.N. (1993) RULA: A Survey Method for the Investigation of Work-Related Upper Limb Disorders. *Applied Ergonomics*, **24**, 91-99. https://doi.org/10.1016/0003-6870(93)90080-S

[8] Thai Industrial Standard Institute (2002) Thai Anthropometry Survey Report, Phase 4, 2000-2001. [Online] http://e-book.ram.edu/e-book/a/AE313/ae313-supplement.pdf

[9] Silasut, A. (1985) Fabric Properties. *Journal of Cotton and Textile.*

[10] Sasikala, K. and Prescilla, R. (2016) Risk Perception of Musculoskeletal Injury among Critical care Nurses at Sri Ramakrishna Hospital, Coimbatore. *International Journal of Advances in Nursing Management*, **4**, 339-344. https://doi.org/10.5958/2454-2652.2016.00076.7