Jurnal
Berita Ilmu Keperawatan

Jurnal Berita Ilmu Keperawatan
Vol. 15 (2), 2022
p-ISSN: 1979-2697
e-ISSN: 2721-1797

Effectiveness of Progressive Mobilization on Functional and Hemodynamic Status in Bedrest Patients in the ICU: Randomized Controlled Trial

Dina Aryanti[1]*, Dudut Tanjung[2], Asrizal[3]

[1,2,3]*Faculty of Nursing, Universitas Sumatera Utara, 20155, North Sumatera, Indonesia*
*correspondence : dinaaryanti1010@gmail.com

Abstract: *Patients with health problems who undergo bed rest for a long time can experience various health problems. Problems that can be felt by patients on functional and hemodynamic status. This study aims to identify the effectiveness of progressive mobilization on functional status and hemodynamics in bed rest patients. The research method used a qualitative design with a randomized controlled trial method. The number of samples in this study was 70 people for each group. The sample in this study was taken by simple random sampling method with a total of 70 people in the control group and 70 people in the intervention group. Bivariate statistical test used Friedman and Mann Whitney test, while multivariate test used logistic regression. The results of this study showed that there was a significant effect of progressive mobilization on functional and hemodynamic status (p<0.05). The conclusion of this study is that progressive mobilization is effective on the functional and hemodynamic status of the patient so that it can be applied in the ICU of the hospital as a nursing intervention*

Keywords: *Bedrest, Hemodynamic, Progressive Mobilization, Status Functional*

INTRODUCTION

Bed rest generally lasts a long time when the patient is admitted to the ICU. Prolonged bed rest can have a negative impact on patients such as rapidly decreasing muscle mass and bone mineral density and disturbances in other body systems that can be seen in the first week (Parry & Puthucheary, 2015). The longer treatment in the intensive care unit can cause long-term effects such as sustained muscle weakness, impaired physical function as well as neurocognitive and psychiatric symptoms which are collectively known as the post-intensive care syndrome (Nedham et al., 2012).

Several factors cause the patient to be bed rest, among others, because of sedative drugs or because of chronic disease. Low levels of physical activity and muscle strength are associated with decreased physical function in intensive care. Despite the evidence that early mobilization is safe and feasible, active mobilization in bed and outside of bed remains low (Hodgson et al., 2014).

Patients who undergo bed rest can be mobilized early since 24-48 hours of treatment (Bailey et al., 2009). Many studies on early mobilization of patients admitted to the ICU have been carried out. Previous research has shown that exercise and mobilization can improve muscle strength, neuromotor coordination, balance and gait. In addition, it can optimize the autonomic system and increase venous return and cardiac output, as well as reconditioning efforts. Respiratory benefits refer to increased oxygen transport, increased tidal volume, increased thoracic expansion and improved drainage of respiratory secretions (Zorowti, 2016).

Research conducted by Needham et al. (2010) found that mobilization interventions in patients in the ICU can provide the benefits of increasing muscle strength, reducing length of stay, reducing dependence on delirium patients, and length of use of ventilators. The American Association of Critical

Care Nurses (2009) recommends progressive mobilization as a nursing intervention for patients being treated for bed rest.

Previous studies have explained that progressive mobilization interventions can improve the patient's ability, make the patient move faster and improve functional status (Ningtyas, 2017). Therefore, this study aims to identify the effectiveness of progressive mobilization on the functional and hemodynamic status of patients undergoing bed rest in the ICU.

METHOD

The research method is a quantitative randomized controlled trial. The number of samples in this study were 70 respondents each for the control and intervention groups (Cartwight, 2017). Samples were taken randomly following the inclusion criteria as follows: Adult patients aged 18-60 years, hemodynamically stable, surgical and non-surgical patients admitted to the ICU >24 hours, and patients diagnosed with CHF categories NYHA 1 and NYAHA II. Patients with desaturation and MAP <65 mmHg, history of myocardial infarction, dysrhythmias and elevated intracranial pressure were excluded from this study.

The research intervention was carried out for 5 days, the control group intervention followed the SOP from the hospital room, while the actions carried out in the intervention group were based on the SOP made by the researcher. The steps in the study are described as follows: Research assistants or researchers observe the patient's condition on the first day, then progressive mobilization actions are carried out in the control group and intervention based on SOP. Every day Progressive mobilization actions are carried out 2 times at 09.00 and 15.00 WIB. Measurements of hemodynamic status such as blood pressure, respiration, heart rate, temperature and oxygen saturation were obtained through observation of the patient's vital signs monitor. While the functional status using the Barthel Index instrument with a monitoring sheet.

The CVI results for the Barthel index instrument are 0.98 and the CVI (Content Validity Index) and reliability values are Cohen Kappa values > 0.60 or almost close to the value. The results of the study were then carried out with a bivariate test with Friedman's test and Bonferoni's posthoc test with a p value <0.05. This study also considers research ethics issued by the research ethics commission of the nursing faculty of the University of North Sumatra with number 1774/4/SP/2019.

RESULTS

This study provides an explanation of the effect of applying progressive mobilization on functional and hemodynamic status in bed rest patients in the Intensive Care Unit (ICU) RSU Mitra Medika Medan. Table 1 shows the characteristics of the research respondents, namely 35 people who were given progressive mobilization intervention, showing that 34.4% were in the early elderly age range (46-55 years), with gender as much as 77.1% male, and The education level of the treatment group, namely junior high school, was 40%. The most common disease diagnoses were CHF at 34.4%, while the severity of the disease suffered was a disease with complications as much as 77.1%, and the use of vasoactive/inotropic drugs was 54.3%.

Table 1. Frequency Distribution and Percentage Of Respondents Based On The Characteristics Of The Control And Intervention Groups

Responden Characteristic	Intervention Group		Control Group		*P Value*
	n (35)	%	n (35)	%	
Age					
Early adulthood (26-35 tahun)	6	17.1	7	20	0.068
Late adult (36-45 tahun)	7	20	7	20	0.052
Early seniors (46-55 tahun)	12	34.4	3	8.6	0.064
Pra elderly (56-65 tahun)	6	17.1	15	42.8	0.058
Old Age (> 65 tahun)	4	11.4	3	8.6	0.054
Mean	47.8		49.4		
Gender					
Man	8	2.9	12	34.3	0.056
Women	27	77.1	23	65.7	0.058
Education					
primary school	4	11.4	6	17.1	0.062
Elementary high school	14	40	11	31.4	0.056
Senior high school	9	25.7	9	25.7	0.070
College	8	22.9	9	25.7	0.066
Disease Diagnosis					
Chronic Heart Failure	12	34.3	10	28.6	0.052
Stroke	9	25.7	8	22.9	0.062
Breathing Failure	2	5.7	6	17.1	0.057
Diabetes Melitus	2	5.7	2	5.7	0.061
Hypertension	8	22.9	8	22.9	0.072
Tuberculosis	2	5.8	1	2.9	0.075
Disease Severity					
Complication	27	77.1	31	88.6	0.060
Non Complication	8	22.9	4	11.4	0.063
Drug Vasoactive/Inotropic					
Yes	16	45.7	18	51.4	0.058
No	19	54.3	17	48.6	0.052

Table 2. Shows the significant effect of progressive mobilization protocol on functional status in the treatment group. In the first observation result (day 3) with a value (p = 0.048), the second observation result (day 5) with a value (p = 0.000), and the third result observation (day 7) that is (p = 0.000) . These results indicate that there is an increase in continuous improvement with functional status conditions after the researchers carried out the progressive mobilization protocol.

Table 2. The Effectiveness Of Progressive Mobilization On Functional Status Before And After Intervention In The Treatment Group And The Control Group (N=70)

	Intervention Group		Control Group	
Functional Status	z	*p*	z	*p*
Observation Result 1 (Days-3)	1.823	0.048	3.689	0.068
Observation Result 2(Days-5)	4.020	0.000	4.824	0.042
Observation Result 3 (Days-7)	4.443	0.000	5.042	0.035

Table 3. Shows the significant effect of the progressive mobilization protocol on changes in the stability of systolic blood pressure in the treatment group. In the first observation result (day 3) with a

value (p = 0.044), the second observation result (day 5) with a value (p = 0.021), and the third result observation (day-7) with a value (p = 0.000). These results indicate that there is a significant change in systolic blood pressure after the progressive mobilization protocol intervention.

Table 3. The Effectiveness Of Progressive Mobilization On Systolic Blood Pressure Before And After Intervention In The Treatment Group And The Control Group (N=70)

systolic blood pressure	**Intervention Group**		**Control Group**	
	z	*p*	z	*p*
Observation Result 1(Days-3)	2.018	0.044	1.958	0.050
Observation Result 2(Days-5)	2.330	0.021	2.759	0.033
Observation Result 3(Days-7)	4.448	0.000	2.330	0.023

Table 4. Shows the significant effect of progressive mobilization protocol on changes in diastolic blood pressure stability in the treatment group. The first observation result (day 3) is (p=0.443), the second observation result (day 5) is (p=0.033), and the third observation result (day-7) is (p=0.021). These results indicate that there is a significant change in diastolic blood pressure after the progressive mobilization protocol intervention.

Table 4. The Effectiveness Of Progressive Mobilization On Diastolic Blood Pressure Before And After Intervention In The Treatment Group And The Control Group (N=70)

Diastolic blood pressure	**Intervention Group**		**Control Group**	
	z	*p*	z	*p*
Observation Result 1(Days-3)	0.768	0.443	0.644	0.520
Observation Result 2(Days-5)	2.858	0.033	0.644	0.520
Observation Result 3(Days-7)	2.132	0.021	0.062	0.951

Table 5. Shows the significant effect of progressive mobilization protocol on pulse rate in the treatment group. In the first observation result (day 3) with a value (p=0.581), the second result observation (day 5) with a value (p=0.000), and the third result observation (day-7) with a value (p=0.000). These results indicate that there is a significant change in pulse rate after the progressive mobilization protocol intervention.

Table 5. The Effectiveness Of Progressive Mobilization On Pulse Rate Before And After Intervention In The Treatment Group And The Control Group (N=70)

Pulse Status	**Intervention Group**		**Control Group**	
	z	*p*	z	*p*
Observation Result 1(Days-3)	0.552	0.581	0.294	0.768
Observation Result 2(Days-5)	4.258	0.000	0.949	0.343
Observation Result 3(Days-7)	0.880	0.000	2.852	0.004

Table 6. Shows the significant effect of the progressive mobilization protocol on oxygen saturation in the treatment group. In the first observation result (day 3) with a value (p = 0.491), the second observation result (day 5) with a value (p = 0.014), and the third result observation (day 7) with a value (p = 0.002). These results indicate that there is a significant change in oxygen saturation after the progressive mobilization protocol intervention.

Table 6. Effectiveness Of Progressive Mobilization On Oxygen Saturation Before And After Intervention In The Treatment Group And The Control Group (N=70)

Oxygen Saturation Status	Intervention Group		Control Group	
	z	*p*	z	*p*
Observation Result 1(Days-3)	0.689	0.491	2.899	0.004
Observation Result 2(Days-5)	2.456	0.014	1.779	0.075
Observation Result 3(Days-7)	3.132	0.002	2.264	0.024

Table 7. Shows the significant effect of progressive mobilization protocol on temperature in the treatment group. In the first observation result (day 3) with a value (p=0.261), the second observation result (day 5) with a value (p=0.000), and the third result observation (day-7) with a value (p=0.000). These results indicate that there is a significant change in temperature after the progressive mobilization protocol intervention.

Table 7. The Effectiveness Of Progressive Mobilization On Temperature Before And After Intervention In The Treatment Group And The Control Group (N=70)

Temperature	Intervention Group		Control Group	
	z	*p*	z	*p*
Observation Result 1(Days-3)	1.123	0.261	3.865	0.000
Observation Result 2(Days-5)	4.059	0.000	4.368	0.000
Observation Result 3(Days-7)	4.064	0.000	3.982	0.000

Table 8 shows that the results of the Man Whitney test showed a significant difference in functional status between the treatment group and the control group with a value (p = 0.002). The results of the hemodynamic analysis of the patient included systolic blood pressure (p=0.000), diastolic blood pressure (p=0.001), pulse rate (p=0.0000), oxygen saturation (p=0.005), temperature (p=0.003).

After seeing the results of these differences, we can conclude that there is a difference in the effectiveness of implementing a progressive mobilization protocol compared to the application of mobilization according to hospital SOPs.

Table 8. Comparison Of The Application Of Progressive Mobilization Compared To The Application Of Standard Hospital Operating Procedures On Functional And Hemodynamic Status In Bed Rest Patients In The ICU (n=70)

Variabel	Intervention Group	Control Group	*p*
	Mean Rank	*Mean Rank*	
Functional Status	43.11	27.89	0.002
Hemodynamic			
systolic blood pressure	36.60	34.40	0.000
Diastolic blood pressure	34.51	36.49	0.001
Pulse Status	26.93	44.07	0.000
Respirasi Rate	35.53	35.47	0.000
Oxygen Saturation Status	34.07	36.93	0.005
Temperature	36.66	34.34	0.003

DISCUSSION

The results of the study found that there was a significant progressive mobilization of functional status. In contrast to the intervention group in the control group, no significant differences were found. Patients who undergo bed rest can be mobilized early since 24-48 hours of treatment (Bailey et al., 2009). Many studies on early mobilization of patients admitted to the ICU have been carried out. Previous research has shown that exercise and mobilization can improve muscle strength, neuromotor coordination, balance and gait. In addition, it can optimize the autonomic system and increase venous return and cardiac output, as well as reconditioning efforts. Respiratory benefits refer to increased oxygen transport, increased tidal volume, increased thoracic expansion and improved drainage of respiratory secretions (Zorowti, 2016).

Progressive mobilization is a combination of exercises with head elevation, passive ROM and active ROM as well as left and right tilt, sitting, moving and walking. These exercises can improve functional status in bed rest patients. In line with the research conducted by Cassaburi et al. (2009) found that progressive mobilization exercise can reduce the production of lactic acid in the blood due to increased limb function.

In this study, it was found that progressive mobilization had a significant effect on blood pressure. Bed rest performed on patients in the long term can affect the cardiovascular system, one of which can reduce cardiac output (Vollman, 2010). Changes in central blood pressure can be influenced by changes in position (Setiyawan, 2016).

However, this is not in line with research conducted by Indriyani, Bedjo, Arwani, & Mardiyoni (2017) which explains that progressive mobilization has no significant effect on breathing $p > 0.05$. Research conducted by Bourdin et al. (2010) moving activities, activities and walking activities as part of progressive mobilization can increase the supply of oxygen into the lungs (Volman, 2010). An increase in oxygen saturation from 98% to 99% can occur after progressive mobilization (Ozyurek, 2012).

The indicator of oxygen status is oxygen saturation, oxygen saturation is the ability to bind oxygen (Kozier, 2009). Several factors that can affect oxygen saturation are the amount of oxygen entering the lungs (ventilation), the capacity of hemoglobin in oxygen transport (Widiyanto, 2014).

In addition, this study found that mobilization can affect the patient's body temperature. In line with the research of Cooper, K., & Gosnell, K (2015) mobilization affects temperature rise but is not extreme. Movement of the body can result in contraction of the musculoskeletal system in the body and increase the rate of the circulatory system in the body.

CONCLUSION

Patients who are on bed rest for a long time can experience various health problems such as atelectasis, pneumonia etc. These health problems can be prevented by progressive mobilization. The results of this study found that progressive mobilization was effective on functional and hemodynamic status. This progressive mobilization SOP can be used as a standard nursing intervention in the ICU.

Progressive mobilization intervention is one of the nursing actions in basic nursing and medical surgical nursing. Progressive mobilization measures have been adapted to evidence-based practice nursing. In further research, progressive mobilization interventions can be developed in order to improve the quality of nursing care in hospitals.

REFERENCES

Amidei, C. (2012). Measurement of physiologic responses to mobilisation in critically ill adults. Intensive and Critical Care Nursing, 28(2), 58-72. DOI: 10.1016/j.iccn.2011.09.002

Bassett, R. D., Vollman, K. M., Brandwene, L., & Murray, T. (2012). Integrating a multidisciplinary mobility programme into intensive care practice (IMMPTP): a multicentre collaborative. Intensive and Critical Care Nursing, 28(2), 88-97. DOI: 10.1016/j.iccn.2011.12.001

Bailey, P., Thomsen, G. E., Spuhler, V. J., Blair, R., Jewkes, J., Bezdjian, L., ... & Hopkins, R. O. (2007). Early activity is feasible and safe in respiratory failure patients. Critical care medicine, 35(1), 139-145. DOI: 10.1097/01.CCM.0000251130.69568.87

Burtin C1, Clerckx B, Robbeets C, Ferdinande P, Langer D, Troosters T, Hermans G, Decramer M, Gosselink R. Early exercise in critically ill patients enhances short-term functional recovery N Engl J Med. 2009 Mar 26;360(13):1329-35. doi: 10.1056/NEJMct0804632.

Zorowitz, R.D. (2016). ICU-Acquired Weakness: A Rehabilitation Perspective of Diagnosis, Treatment, and Functional Management. Chest. 2016 Oct;150(4):966-971. doi: 10.1016/j.chest.2016.06.006

Hodgson C, et al. Expert consensus and recommendations on safety criteria for active mobilization of mechanically ventilated critically ill adults. Crit Care. 2014;18(5):658. DOI: 10.1186/s13054-014-0658-y

Sugiarto, N., & Darmawan, E. S. (2014). The Factors affecting the length of stay in the Intensive Care Units of Pertamina Central Hospital in Indonesia related to healthcare associated Infections. Journal of US-China Medical Science, 11, 195-204. DOI:10.17265/1548-6648/2014.04.004

Parry, S.M., & Puthucheary, Z.A. (2015). The impact of extended bed rest on the musculoskeletal system in the critical care environment. Extrem Physiol Med 4, 16 https://doi.org/10.1186/s13728-015-0036-7

Potter Patricia, A., & Perry Anne, G. (2010). *Nursing Fundamental 7th edition* (Fundamental Keperawatan Edisi 7) Buku 1. Jakarta: Salemba Medika.

Johnson, K.L & Bruch, G. (2007). Neuromuscular Complications In The Intensive Care Unit: Critical Illness Polyneuromyopathy. AACN. DOI: 10.1097/01.AACN.0000269260.99169.70

Dunn, H., Quinn, L., Corbridge, S. J., Eldeirawi, K., Kapella, M., & Collins, E. G. (2017). Mobilization of prolonged mechanical ventilation patients: An integrative review. Heart & Lung, 46(4), 221-233. DOI: 10.1016/j.hrtlng.2017.04.033

Rebel, A., Marzano, V., Green, M., Johnston, K., Wang, J., Neeman, T., ... & Bissett, B. (2018). Mobilisation is feasible in intensive care patients receiving vasoactive therapy: An observational study. Australian Critical Care. DOI: 10.1016/j.aucc.2018.03.004

Chen, S., Su, C. L., Wu, Y. T., Wang, L. Y., Wu, C. P., Wu, H. D., & Chiang, L. L. (2011). Physical training is beneficial to functional status and survival in patients with prolonged mechanical ventilation. Journal of the Formosan Medical Association, 110(9), 572-579. DOI: 10.1016/j.jfma.2011.07.008

Vasilevskis, E. E., Ely, E. W., Speroff, T., Pun, B. T., Boehm, L., & Dittus, R. S. (2010). Reducing iatrogenic risks: ICU-acquired delirium and weakness—crossing the quality chasm. Chest, 138(5), 1224-1233. DOI: 10.1378/chest.10-0466

Morris, P. E. (2007). Moving our critically ill patients: mobility barriers and benefits. Critical care clinics, 23(1), 1-20. DOI: 10.1016/j.ccc.2006.11.003

Needham, D. M., Korupolu, R., Zanni, J. M., Pradhan, P., Colantuoni, E., Palmer, J. B., ... & Fan, E. (2010). Early physical medicine and rehabilitation for patients with acute respiratory failure: a quality improvement project. Archives of physical medicine and rehabilitation, 91(4), 536-542. DOI: 10.1016/j.apmr.2010.01.002

Hassan, A., Rajamani, A., & Fitzsimons, F. (2017). The MOVIN'project (Mobilisation Of Ventilated Intensive care patients at Nepean): A quality improvement project based on the principles of knowledge translation to promote nurse-led mobilisation of critically ill ventilated patients. Intensive and Critical Care Nursing, 42, 36-43. DOI: 10.1016/j.iccn.2017.04.011

Needham D. (2012). Improving long-term outcomes after discharge from intensive care unit: report from a stakeholders' conference. Crit Care Med.;40:502–9. DOI: 10.1097/CCM.0b013e318232da75

Ningtyas, N. W. R., Pujiastuti, R. S. E., & Indriyawati, N. (2017). Effectiveness Of Progressive Mobilization Level I and II On Hemodynamic Status and Decubitus Ulcer Risk in Critically Ill patients. Belitung Nursing Journal, 3(6), 662-669. https://doi.org/10.33546/bnj.289

Deaton, A., & Cartwright, N. (2018). Understanding and misunderstanding randomized controlled trials. Social Science & Medicine, 210, 2-21. https://doi.org/10.1016/j.socscimed.2017.12.005

Sastroasmoro, S., & Ismael, S. (2011). *Basic Metodology of Clinical Research* (Dasar-Dasar Metodologi Penelitian Klinis). Jakarta: Sagung Seto, 372.

Schweickert, W. D., Pohlman, M. C., Pohlman, A. S., Nigos, C., Pawlik, A. J., Esbrook, C. L., ... & Schmidt, G. A. (2009). Early physical and occupational therapy in mechanically ventilated, critically ill patients: a randomised controlled trial. Lancet (London, England), 373(9678), 1874-1882. DOI: 10.1016/S0140-6736(09)60658-9

Casaburi R, ZuWallack R. (2009). Pulmonary rehabilitation for management of chronic obstructive pulmonary disease. N Engl J Med 2009; 360(13):1329-1335. DOI: 10.1056/NEJMct0804632

Vollman, K. M. (2010). Introduction to progressive mobility. Critical Care Nurse, 30(2), S3-S5. 26. DOI: 10.4037/ccn2010803

Johnson, K.L & Bruch, G. (2007). Neuromuscular Complications In The Intensive Care Unit: Critical Illness Polyneuromyopathy. AACN. DOI: 10.1097/01.AACN.0000269260.99169.70

Vollman, K. M. (2013). Advancing Early Mobility in Critical Care : Evidance Based Strategies for Making it Happen. Critical Care Research and Practice.

Cooper, K., & Gosnell, K. (2015). Study Guide for Foundations of Nursing. Elsevier Health Sciences. https://www.elsevierhealth.com.au/catalog/product/view/id/6509/s/study-guide-for-foundations-of-nursing-9780323524537/category/505/