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The effectiveness of discharge planning and range of motion (ROM) training in increasing muscle strength of nonhemorrhagic stroke patients

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ABSTRACT

Background: Non-hemorrhagic stroke patients experience hemiparesis, an improper handling results in joint contractures. Discharge planning combined with a range of motion (ROM) training given to patients and their families are expected to improve muscle strength in patients after returning from the hospital.
Aims: This study is to identify the effectiveness of discharge planning in increasing muscle strength.
Methods: This is a quasi-experimental study with a pre-posttest design. A total of 34 respondents were selected by cluster random sampling technique, from RAA Soewondo Pati General Hospital of Pati, Central Java, Indonesia. The respondents were divided equally into two groups; an intervention group (N = 17) was given a discharge planning program together with stroke information and range of motion (ROM) training while the control group (N = 17) received a standard discharge planning available in the hospital. Further, Muscle Rating Scale (MRS) was employed to assess the muscle strength on the 2nd, 7th, and 14th day after discharge planning presented to the nonhemorrhagic stroke patients.
Results: This present study clearly acknowledges the standard discharge planning program available in the hospital improve the muscle strength of the upper and lower extremity in the nonhemorrhagic stroke patients just 2nd day after the care (*pretest*), and the significant improvement was observed until the day 14. Moreover, combining the care with ROM training at the intervention group faster the recovery and the muscle strength improved significantly at the 7th day and continue increase at the day 14. Looking to the muscle strength since the 2nd day to the day 14, respectively the muscle strength of upper and lower limb at the control group improved at the point of 0.588 and 0.882, while at the group received the ROM training reached the value of 1.472 and 1.412.
Conclusions: The ROM training combined to the current discharge planning program will faster the muscle strength recovery of the nonhemorrhagic stroke patients. This research provide insight how family plays important role to the success in monitoring the rehabilitation and recovery progress.

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INTRODUCTION

Stroke, according to World Health Organization (WHO), is a permanent clinical sign due to disruption of blood circulation to the brain which lasts about 24 hours or more and can cause acute brain disorders and even death without apparent symptoms other than vascular, which can happen anytime and anyone and

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can cause paralysis and even death. Stroke are defined into two types, namely ischemic stroke and hemorrhagic stroke. About three-quarters of strokes are caused by ischemia or infarction and a quarter is due to hemorrhagic disease and nearly 83% of patients have an ischemic stroke [1, 2]. In 2010, nearly 17 million people in the world suffered this disease, while in the United States every year around 800,000 people experience varied stroke and recurrent strokes and this disease becomes a leading cause of disability [3]. In 2013, Indonesia national stroke prevalence reached to 8.3%, while the prevalence in Central Java hit 7.6% [4]. At the study population, In RAA Soewondo Pati Hospital, the number of stroke patients increases every year while in 2016 there were 809 stroke patients, with an average visit of about 67 patients each month. After 6 months, patients with stroke will experience an impact of 50% hemiparesis, 30% barely walk without any assistant, 46% cognitive deficits, 35% symptoms of depression, 19% aphasia, 26% depending on activities of daily life [5]. The worst case, the patients may suffer paralysis, in which patients cannot move normally, and the recent study shows 35% of hemorrhagic stroke patients suffer irreversible paralysis, and 20-25% of them unable to walk without help while 65% barely use their hands for daily life activities [6]. In providing the treatment, attention should be concerned on rehabilitation measures, prevention of complications and recurrent strokes, thus the patients can return to meaningful activities [7]. In addition to providing rehabilitation measures, promotive and preventive measures are needed in order to prevent recurrent complications and strokes with the provision of discharge planning [8].

The range of motion (ROM) training is a form of exercise in the rehabilitation process for the stroke patients, and it presents positive results both physically and psychologically in preventing the disability in the stroke patients, thus, the quality of life can increase [9]. Compare to other therapy in a nursing care, ROM training is relatively more effective, easy to be applied and considered with low cost. A study from Mawarti and Farid orchestrate the ROM application towards acute stroke patients, given two times per day in seven consecutive days, was following with a muscle strength improvement [10]. Nevertheless, the current stroke patients in hospital were only given the ROM two times of a week. As result, the treatment was ineffective in increasing the muscle strength or even declining.

The patients and their family need to know about the disease process, find out how to handle it and the continuity of care in the rehabilitation phase and adaptation that is arranged in a discharge planning [11]. Family is effective and responsible for fast stroke recognition and response, and to reduce the risk of disability [12]. Discharge planning aims to empower and maximize the potential of patients to live independently by means of support and resources that are in the family [13]. Therefore, through the proper discharge arrangment which contains stroke information together with ROM can improve the rehabilitation progress effectively in home.

At the study site of RAA Soewondo Pati General Hospital of Pati, Central Java, Indonesia, the discharge planning program providing to the stroke patients at the nursing care unit is limited to routine activities in the daily visit or patient returns, including in providing information of time control, medication and some required lifestyle changes. The ROM rehabilitation is only given twice a week and it also takes a particular time because physiotherapy was only done in the hospital. As the consequences, the patient experienced some void for a long time to come back to physiotherapy, thus, the progress of improving the muscle strength in the post-stroke patients was very slow or none at all even decreased. The nursing care with the provision of discharge planning must be carried out optimally so that patients and families who suffer a stroke can care for family members by providing information about strokes and rehabilitation (ROM exercises). Thus, when the families return home, they will be able to care the patients by providing ROM training that expects improvement to the patient's muscle strength, or at least there is no complication occurred. This study aims to analyze the effectiveness of discharge planning on increasing muscle strength in patients with non-hemorrhagic stroke" in RAA Soewondo Pati General Hospital in Pati, Central Java, Indonesia.

METHODS

This is a quasi-experiment employed a pretest-posttest design with control group. The population in this study were 59 nonhemorrhagic stroke patients with a sample size of 34 nonhemorrhagic stroke patients selected room at RAA Soewondo General Hospital, Pati, Central Java, Indonesia. In this study, the sampling technique was carried out by means of Cluster Random Sampling based on treated room, where the participants from Gading I and Gading II room were recruited as the intervention group, while the respondents from Dahlia and Flamboyan as the control group. The inclusion criteria used in this study

were: Stroke patients treated after 24 hours in the treatment room, compositional awareness based on Glasgow Coma Scale (GCS) assessment 13-15, family members aged 18-60 years old, minimum family education at high school, willing to be a respondent by signing informed consent. Family members recorded with health problems or in a critical condition, or refused to continue will be excluded from the study.

Table 1. Respondents' characteristics

Characteristics	Control (N=17)		Intervention (N=17)		Total		*p* value
	N	%	N	%	N	%	
Age							
40-54	8	47.1	5	29.4	13	38.2	0.521
55-64	6	35.3	5	29.4	11	32.4	
65-75	2	11.8	4	23.5	6	17.6	
>76	1	5.9	3	17.6	4	11.8	
Gender							
Male	9	52.9	7	41.2	16	47.1	0.550
Female	8	47.1	10	58.8	18	52.9	
Education							
No school	5	29.4	14	82.4	19	55.9	0.098
Elementary School	10	58.8	3	17.6	13	38.2	
Junior High School	2	11.8	-	-	2	11.8	
Occupation							
laborer	2	11.8	4	23.5	6	17.6	0.269
farmer	13	76.5	12	70.6	25	73.5	
entrepreneur	2	11.8	1	5.9	3	8.8	
Risk factor							
Hypertension	17	100	14	82.4	31	91.2	0.001
DM	0	0	3	17.6	3	8.8	
Attack Frequency							
the first time	17	100	15	88.2	32	94.1	0.002
>1	0	0	2	11.8	2	5.9	
Admission Time							
<6 hour	14	82.4	12	70.6	26	76.5	0.118
>6 hour	3	17.6	5	29.4	8	23.5	
Hemiparesis							
Right	10	58.8	8	47.1	18	52.9	0.550
left	7	41.2	9	52.9	16	47.1	

Intervention group received discharge planning which contains stroke information and ROM training while control group received the standard discharge planning program available in the hospital. At the day before treatment (pretest) and the 7th and 14th day of treatment (posttest), the muscle strength and joint contractures of the extremities of the patient were assessed in the hospital during the period of rehabilitation control. Before participation, the respondents were given oral and written consent. The research designs and procedures of this study have been approved by Ethical Commission of Politeknik Kesehatan Kemenkes Semarang (Semarang Health Polytechnic), No. 132/KEPK/Poltekkes-Smg/EC/2018, on May 3rd, 2018.

Medical Research Council (MRC) scales, consisting of 6 levels, have been performed by the registered and trained nurse to measure the muscle strength by following the standard procedure. To measure the muscle strength, the patients were asked to be in a recumbent potition. In measuring the extremities superior, the patients were asked to lift their weaker hand (left hand for right-handed patient) then the scoring was done from zero (no movement was

observed until five (muscle fully contracted normally). In measuring the muscle strength of the extremities inferior, the patients were asked to lift their weaker leg (left leg for right-handed patient) then the nurse scored from zero (no movement was observed) until five (muscle fully contracted normally). The measurement of joint contractures was performed with a goniometer by the same nurses. Patients and their family were briefly explained to the daily ROM monitor sheet before filling the form.

Statistical analysis used in this study was General Linear Model (GLM) and post hoc to find the difference of muscle strength before and after intervention post-test I (day 7) and post-test II (day 14) as well as the mean difference between the intervention group and control group.

RESULTS

As shown in Table 1, most of the patients were in age group 40-54 years old and 55-64 years old (38.2% and 32.4%). There was no sifnificant difference between intervention and control group in age. Based on gender, there were more females than males in all respondents. The data of education also shows that more than a half of all respondents had no education (55.9%), while the other 38.2% and 11.8% finished their elementry school and junior high school, respectively. Based on occupation data, most of the respondents were farmer (73.5%) and the least was entrepreneur (8.8%). Based on the characteristic data, more patients in control group have hypertension history, compared to the intervention group. Interestingly, no patient in control group experienced stroke more than 1 time and had diabetes mellitus. In intervention group, while 14 patients had record having hypertension complication and 3 patients with DM complication; among them, 15 patients claim experienced stroke for the first time and 2 patients recorded with stroke more than one time attack.

Table 2 shows that there was no significant difference between intervention group and control group in upper and lower extremity muscle strength at. These results confirm that both group had the same base status prior the treatment. Furthermore, after the administration of intervention and control, the significant improvement was appeared in fourteenth day of upper extremety measurement between intervention and control group (p value = 0.003) but not in lower extremity measurement as shown in Table 3.

Table 4 orchestrates the muscle strength improvement at the control and the intervention group, comparing the value (as the mean difference) before the treatment given (pretest) and day 7 (posttest I) and day 14 (posttest II) after the assessment. Repeated ANOVA analysis considers the significant mean difference. The results show that the patients at the control and intervention group experienced strength muscle improvement both the upper and lower extremity.

Table 2. Muscle strength of upper and lower extremities in the control group (N=17) and intervention groups (N = 17) before the intervention given (*pretest*)

Muscle strength	***Type III Sum of Squares***	***Mean Square***	**F**	***p* value**
Upper extremity	5.186	5.186	3.677	0.064
Lower extremity	1.657	1.657	0.726	0.400

Table 3. Muscle strength of upper and lower extremities in the control group (N=17) and intervention groups (N = 17) before intervention (*pretest*) and at the 7th and 14th day after the treatment (*post-test*)

Muscle strength		Intervention (N=17)		Control (N=17)		*p* value
		Mean	SD	Mean	SD	
Upper extremity	Pretest	1.88	0.781	1.82	0.728	0.822
	Post-test I (day 7)	2.47	0.624	2.12	0.781	0.155
	Post-test II (day 14)	3.35	0.862	2.41	0.870	0.003
Lower extremity	Pretest	1.65	0.862	1.59	0.939	0,850
	Post-test I (day 7)	2.29	0.849	2.18	1.015	0.716
	Post-test II (day 14)	3.06	0.899	2.47	1.007	0.082

Table 4. Muscle strength improvement (mean difference) of the upper and lower extremity of the stroke patients at the control group (N=17) and intervention groups (N = 17) before intervention (*pretest*) and at the 7th and 14th day after the treatment (*post-test*)

Muscle strength		**Intervention**		**Control**	
		Mean difference	***p* value**	***Mean difference***	***p* value**
Upper extremity	Δ *pre-post test I*	0.588	0.011	0.294	0.060
	Δ *pre-post test II*	1.471	0.000	0.588	0.004
	Δ *post I-post test II*	0.882	0.000	0.294	0.060
Lower extremity	Δ *pre-post test I*	0.647	0.000	0.588	0.010
	Δ *pre-post test II*	1.412	0.000	0.882	0.000
	Δ *post I-post test II*	0.765	0.000	0.294	0.060

Interestingly, discharge planning program combined with stroke information and ROM training given to the stroke patients in the intervention group results with significant improvement of the muscle strength at the upper extremity (0.588). The results show the ROM training may faster the upper limb improvement only 7 days after the program (*p* value = 0.011) while at the control group with no ROM training the improvement can be observed after 14 days. The muscle strength improvement of the upper and lower extremity even can be observed until the 14 days at the both groups, however, significant improvement can be observed at the intervention group.

DISCUSSION

Stroke can cause the decrease of muscle strength, thus, the discharge planning is important to the stroke patients in increasing the muscle strength. In this study muscle strength was measured three times, pre-test on the second day of treatment, post-test I on the seventh day of treatment and post-test II on day fourteenth day of treatment. Table 2 shows that there was no significant difference in upper limb muscle strength (*p*-value = 0.064) and lower extremity (*p* value = 0.4) between intervention group and control group. In table 3 shows that there was a significant difference in upper extremity muscle strength in post-test two (fourteenth day) measurements (*p* value = 0.003) between intervention and control group. Moreover, muscle strength improvement between pre and the two post tests in intervention group were significantly different while in control group was only appeared between pre and post test one (Table 4).

Stroke patients will experience a decrease of the strength of the limb muscles due to hemiparesis. Hemiparesis at one side of the body is often found in stroke patients after hemiplegia. The most common manifestation of hemiparesis is a decrease in muscle strength. Muscle strength is closely related to the neuromuscular system. Namely how much the ability of the nervous system to activate the muscles to contract. Thus, the more muscle fibers are enabled, the greater the strength produced by the muscle [14]. In theory, if the muscles including the extremity muscles are not trained especially on clients who experienced gross motor function impairment in a certain period of time, the muscle will lose its motor function permanently. This happens because the muscles are usually in a state of immobilization.

Limitations of mobilization affect the client's muscles through loss of endurance, reduced muscle mass, atrophy and decreased stability. Other influences from the limitations of mobilization are disorders of calcium metabolism and impaired joint mobilization. Immobilization can affect muscle and skeletal function. As a result of protein breakdown in the muscle, the consumer experiences a loss of body mass that forms part of the muscle. Therefore a decrease in muscle mass is not in a position to maintain activity without increasing fatigue. Muscle mass decreases due to unused metabolism and muscle. If immobilization continues and the muscles are not trained, there will be a continuous decrease in mass. The decrease in the mobilization and movement resulting in large musculoskeletal damage with its main pathophysiological changes is atrophy which required immobilization and bed rest. The decrease in the stability occurs due to loss of endurance, decreased muscle mass, atrophy and actual joint abnormalities so that clients are unable to move continuously and are at risk for falls [15].

Bestowing discharge planning can improve functional status and reduce the risk of recurrence in ischemic stroke patients and to provide health education to patients and their families. This health education including the knowledge about signs, symptoms and

risk factors for stroke as efforts to prevent the occurrence of spasmodic attacks [16]. The ROM exercises twice a day for 7 days can increase muscle strength in the upper extremities [17]. This study supports the previous research [10] orchestrating the provision of ROM exercises twice a day in stroke patients increase muscle strength effectively after the 2nd day.

CONCLUSIONS

Discharge planning providing to the stroke patients in the control and intervention group effectively increased upper and lower limb muscle strength. This present study notice the ROM training given at the intervention group increase muscle strength higher than the value at the control group. The statistical analysis even shows that the increasing at the day 14 was significant only at the intervention group. Moreover, muscle strength improvement between pre and two post tests in intervention group were significantly different while in control group was only appeared between pre and post test one.

As health workers, especially nurses, of course will deal with the problem of returning non-hemorrhagic stroke patients who experience limb weakness. Interestingly, a recent review summarizes results from many studies showing treatments given to stroke patients at a stroke unit will generate better outcomes [18]. Discharge planning can motivate nurses to realize the importance of knowledge and skills in caring for families who suffer strokes with limb weakness. The results of this study prove that giving discharge planning with ROM training to patients and families can increase limb muscle strength in non-hemorrhagic stroke patients. In the implementation of discharge planning a nurse must have expertise in assessment, and coordinate, have expertise in communicating and realizing the resources that exist in the community so that a nurse must have knowledge, attitudes and skills in planning nursing care.

CONFLICT OF INTERESTS

None declared.

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