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## THE EFFECTIVENESS OF VIDEO-BASED ROM EXERCISE TELENURSING ON IMPROVING JOINT MUSCLE STRENGTH IN POST-STROKE PATIENTS

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### ABSTRACT

*Post stroke is the period after a stroke patient has passed through the critical phase of the stroke. It has different implications depending on the level of the stroke that has occurred. Each year, 12.2 million individuals worldwide suffer from strokes. Each year, 6.5 million people die from strokes worldwide. Stroke is the world's third most common cause of disability and second leading cause of death. Post-stroke has substantial morbidity since it can cause permanent impairment in up to 50%. In the post-stroke period, the role of the family is important in meeting daily needs, providing physical and emotional support, and implementing rehabilitation as a stage to maintain balance and range of motion in the stroke patient's joint. Data revealed that approximately 88%-95% of post-stroke patients require care from family members and friends in the community. One of these strategies is the use of video-based telenursing by the family. This study aims to analyse the effectiveness of telenursing video-based ROM exercise by families on increasing joint muscle strength in post-stroke patients at Pandan Regional General Hospital (RSUD Pandan). The research method is quasi-experimental with telenursing intervention. The population consists of 171 post-stroke patients who have been treated at RSUD Pandan and cared for by their families. The instruments used were muscle strength and family knowledge of ROM. The sampling was carried out using a purposive sample of 40 respondents. The data collection method was a questionnaire instrument which is Anakova test. The research results obtained  $\text{sig } 0,004 < 0,050$  which is mean that video-based telenursing ROM exercise by family were effective on improving joint muscle strength in post-stroke patients but the wrist joint. Video-based telenursing ROM is regularly performed twice a day; in the morning and evening, 15 minutes, and needs to be implemented in nursing care as a media to educate post-stroke patients on self-management.*

**Keywords:** Post Stroke; Video-Based Rom Exercise Telenursing; Joint Muscle Strength

### INTRODUCTION

Stroke is the second leading of mortality in the world with an annual mortality rate reaching to 5,5 million and leaves 50% of those affected chronically

disabled (Donkor, 2018). Riset Kesehatan Dasar in 2018 has recorded the prevalence of stroke in Indonesia is up to 10,9% or 713.783 while North Sumatera has contributed 36.410 patients.

Depending on the severity of the stroke, stroke survivors may experience paralysis of the limbs, which makes activities difficult, weakness of the extremities, difficulty swallowing and eating, difficulty speaking, low self-esteem and even emotional and psychological problems (Sofwan, 2010). The study found that 54.9% of post-stroke patients had low self-esteem. Post-stroke patients who receive therapy can improve motor function by 20% and those who do not receive good post-stroke rehabilitation have 50% residual symptoms in the form of limb muscle weakness (Kim et al., 2016).

ROM is known to be effective in increasing muscle strenght in stroke patients as an exercise/rehabilitation therapy intervention performed on parts of the body in post-stroke patients (Purba et al., 2022). ROM training can affect motor skills and muscle strength in post-stroke patients (Nur Rahayu 2015). Applying ROM 6 times can increase muscle strength (Rismawanti et al., 2021).

ROM exercises can be done by the family to help restore weakness in the limbs of post-stroke patients (Muhsinin & Kusumawardani, 2020). A family member or carer is someone who is responsible for meeting the daily needs and providing physical and emotional support to patients who are unable to care for themselves due to illness, injury or disability (Sherman, 2019). Family need to be educated in the knowledge and skills of post-stroke care to fulfil this role (Kadarwati et al., 2019). Family empowerment requires strategies for self-reliance of family members based on their potential (Nasution et al., 2015). One of the programmes under development is technology support or intervention session such as telephone support (Sureshkumar et al., 2015). Telenursing is one strategy that can improve care delivery. It facilitates access, saves time and resources, and promotes better self-care by allowing healthcare professional to guide and monitor patients as needed

(Souza-Junior et al., 2016). Research by Hosseini et al., (2022) shows that telenursing has an impact on reducing carers' workload in caring for post-stroke patients and improving quality of life for both parties.

Based on the research by Muhsinin et al., (2019) found that the implementation of video-based health education was able to increase family readiness to care for stroke patients. Research by Muhsinin & Kusumawardani (2020) shows the effect of providing educational videos on family skills in performing ROM in post-stroke patients. Telenursing via structured telephone calls, telephone counselling and text messages, mobile-based applications and videos has an impact on patients' knee function. The lack of human resources who are technologically savvy, as well as poor healthcare, information technology facilities, and infrastructure, impede research (Meitri & Herawati, 2022).

Pandan General Hospital recorded the number of post-stroke inpatients as 121 in 2020 and 171 in 2021. The number of stroke inpatients is increasing. Based on the results of interviews conducted with the families did not know how to do ROM exercises, while the results of examination of the joint muscle strength of stroke patients were on a scale of 3. The purpose of this study was to estimate the effectiveness of telenursing video-based ROM exercises performed by the family to increase joint muscles strength sfter stroke.

## RESEARCH METHODOLOGY

This study used a quasi-experimental study design with a video-based ROM telenursing intervention for improvement joint muscle strength in patients after a stroke. The population in this study were post-stroke patients who were registered/receiving inpatient stroke care at Pandan Regional Hospital and their families.

The number of samples taken for 40. The sample size was determined by G-power calculation with an effect size of 0,8 and  $\alpha$

0,05, with an actual power was 0,81. The sample was determined using purposive sampling with the inclusion criteria is being post-stroke patients cared by their families at home, the carer's age being between 18 – 50 years, having at least a high school education, being literate and having an Android mobile phone or laptop device, and being willing to be a sample by voluntarily signing an informed consent form. Family knowledge of ROM is a controlled external variable (covariable) in this study. Control in sampling was by taking families of post-stroke patients who had more than 50% knowledge regarding ROM as assessed by questionnaires given to families of post-stroke sufferers

The independent variable is telenursing video-based ROM exercises, and the dependent variable is muscle strength in post-stroke patients. Muscle strength was measured using manual muscle testing on a five-point scale. A value of 0 if there is no contraction; a value of 1 if the muscle contraction is visible but cannot move; a

value of 2 if there is contraction against gravity but cannot withstand a slight resistance; a value of 3 if the muscle contracts and is able to fully resist gravity but cannot withstand the resistance given; a value of 4 if the muscles can contract against full gravity and can withstand the resistance given for a moment; a value of 5 if the muscle has full strength (normal) (Hidayah & Hakam, 2021). Statistical test uses the analysis of covariance (ANAKOVA) to determine the effect of ROM treatment on muscle strength. Ethical considerations have been made in a relation to this research with the approval of the Ethics Committee of the Faculty of Nursing, University of North Sumatra, number 836/KEPK/USU/2023.

## RESULTS AND DISCUSSION

The results of this study discuss the effect of telenursing video-based ROM exercises by families on increasing joint muscle strength in post-stroke patients.

**Table 1. Distribution of Mean Family Knowledge Before and After Telenursing Intervention Video-Based ROM Exercises**

	Knowledge	Mean	Standar deviation
Intervention group	Pretest	60,50	5,038
	Post test	73,75	5,856

From table 1 is know that the mean of knowledge increased after the video-based ROM training telenursing intervention (mean = 60,50 to 73,75 and sd 5,038 to 5,856).

Table 2 shows that before and after the video-based ROM training there was a change in mean muscle strength.

It found that (Table 3) there was an effect on video-based ROM telenursing by the family on the neck joint muscle strength of post-stroke patients with a value of  $p = 0.000$ . There was an increase in the average value of neck joint muscle strength before the

intervention was 3.40 and after the intervention for 1 month was 4.28. The neck is a part of the body that is made up of rotating joints that allow the neck to rotate  $180^{\circ}$ .

The ROM movement in the neck consist of six simple movements that are often done at the beginning of gymnastics, from primary school to the elderly. The researchers believe that exposure to neck stretching exercises from an early age makes it easier for families, carers and post-stroke patients to accept and practice them.

**Table 2. Distribution of Mean Muscles Strength Before and After Telenursing Intervention Video-Based ROM Exercises**

	<b>Muscles Strength Before</b>	<b>Mean</b>	<b>Standar Deviation</b>
	Neck	3,40	0,545
	Shoulder	3,83	0,549
	Elbow	3,88	0,563
	Wrist	3,60	0,496
	Hand	3,83	0,549
	Arms	3,85	0,533
	Knees	3,80	0,533
	Hips	3,80	0,564
	Feet	3,90	0,545
<b>Kelompok Intervensi</b>	<b>Muscles Strength After</b>	<b>Mean</b>	<b>Standar Deviation</b>
	Neck	4,28	0,554
	Shoulder	4,55	0,504
	Elbow	4,68	0,474
	Wrist	3,90	0,545
	Hand	4,63	0,490
	Arms	4,60	0,496
	Knees	4,30	0,464
	Hips	4,53	0,506
	Feet	4,47	0,506

Neck stretching can reduce pain from gymnastics movements. This is in line with the research by Ashfaq et al., (2022) and Farooq

et al., (2018) which states that routine physiotherapy and passive mobilization of the neck can improve neck deformity, stiffness, and pain.

**Table 3. Anakova's test results on the effectiveness of video-based telenursing ROM exercises for increasing the strength of the joint muscles**

<b>1. Neck Muscles</b>			
Source of variation	Sum of squares	F	Sig.
Corrected Model	15.354 <sup>a</sup>	25.119	.000
Intercept	1.178.112	3.854.740	.000
Knowledge	10.347	33.856	.000
ROM	5.007	16.382	.000
Error	23.533		
Total	1.217.000		
Corrected Total	38.887		

According to the findings of the above research, there was a significant effect of family telenursing video-based ROM

exercises on post-stroke shoulder joint muscles strength ( $p = 0,003 < 0,05$ ).



<b>2. Shoulder Joint Muscles</b>			
Source of variation	Sum of square	F	Sig.
Corrected Model	10.727 <sup>a</sup>	19.244	.000
Intercept	1.402.812	5.033.296	.000
Knowledge	8.097	29.052	.000
ROM	2.630	9.436	.003
Error	21.460		
Total	1.435.000		
Corrected Total	32.188		

Comparing of before and after test scores, the mean score for shoulder joint muscle strength before the intervention was 3,83 and increased to 4,55 (sd = 0,549 to sd = 0,504). The shoulder is a part of the body that is often used in movements to fulfil daily needs. The inability to move due to pain or paralysis can lead to stiffness, resulting in

lifetime morbidity. By utilizing video-based telenursing ROM exercises, patients can perform ROM exercises regularly and accurately. Then Kurashina et al., (2023) found in their research that regular ROM training reduces pain in the shoulder joint as well as increasing range of motion.

<b>3. Elbow Joint Muscles</b>			
Source of variation	Sum of square	F	Sig.
Corrected Model	12.818 <sup>a</sup>	23.354	.000
Intercept	1.462.050	5.327.418	.000
Knowledge	8.464	30.841	.000
ROM	4.354	15.866	.000
Error	21.132		
Total	1.496.000		
Corrected Total	33.950		

The research results showed that the p-value was  $0,000 < 0,05$  which means that there was an effect of video-based ROM telenursing training on elbow joint muscle strength in post-stroke patients. Based on the before and after test scores, before the performing video-based ROM exercises, there was an improvement in mean elbow muscle strength (mean = 3,88 to mean = 4,68, sd = 0,563 to sd = 0,474). Srinayanti et al (2021) found that without early, precise, regular, and continous ROM rehabilitation, there will be no increase in elbow muscle strength. The researchers assume

that the elbow is a part of the body that is susceptible to loss of muscle strength if not properly trained, because people cannot move without moving the elbow joint. Therefore, post-stroke patients who experience pain and weakness in the elbow are at risk of losing interest in training this area. At such times, video-based telenursing by family members can provide emotional and physical support to the patient. Telenursing makes it easier for health professionals to provide health education, including ROM exercises for post-stroke patients (Widiharti & Kamelia, 2021).



<b>4. Wrist Joint Muscles</b>			
Source of variation	Sum of square	F	Sig.
Corrected Model	1.854 <sup>a</sup>	3.377	.039
Intercept	1.125.000	4.096.616	.000
Knowledge	.841	3.061	.084
ROM	1.014	3.692	.053
Error	21.146		
Total	1.148.000		
Corrected Total	23.000		

The research results showed that there was no effect of ROM training using video-based telenursing media by the family on increasing wrist muscles strength in post-stroke patients ( $p = 0,053 > 0,050$ ). ROM exercises can prevent a decrease in joint flexibility and wrist strength (Derison & Surani, 2016). This finding is relevant to research by Kusumawaty & Nurapandi (2022) who found that ROM exercises can increase wrist flexibility and range of motion in post-stroke patients.

Video-based ROM exercises by family members have no effect on the wrist muscles due to several factors including reduced muscle reaction time, difficulty in switching wrist muscles and limited range of joint movement (Kane et al., 2014). Other research have found that arm rotation, which is a hand joint training movement in this study, has an effect on the wrist because arm rotation contributes significantly to carpal kinematics (Chen & Tang, 2013)

<b>5. Hand Joint Muscles</b>			
Source of variation	Sum of square	F	Sig.
Corrected Model	12.920 <sup>a</sup>	23.653	.000
Intercept	1.428.050	5.228.733	.000
Knowledge	9.235	33.815	.000
ROM	3.685	13.492	.000
Error	21.030		
Total	1.462.000		
Corrected Total	33.950		

The research results showed that there was an effect of video-based telenursing ROM training on hand joint muscle strength (upper extremity) with a p-value of  $0,000 < 0,050$ . The average value of hand joint muscle strength increased from 3,84 to 4,63 after 1 month of telenursing video-based ROM training. This is relevant to several studies collected (Srinayanti et al., 2021) that ROM exercises can improve muscle strength and improve the patient's ability to perform daily activities.

Weakness on one side of the body in people with stroke or hemiparesis results in reduced muscle tone, leaving the patient unable to move their body (immobilisation). Prolonged immobilisation can lead to complications, one of which is contracture (Anita, 2021). It can be assumed that the strength of joint muscle in patients after a stroke can be increased by giving them ROM exercises on regular basis using the correct technique and method, which can be guided by video-based ROM telenursing.



<b>6. Arms Joint Muscles</b>			
Source of variation	Sum of square	F	Sig.
Corrected Model	11.253 <sup>a</sup>	20.931	.000
Intercept	1.428.050	5.312.739	.000
Knowledge	7.189	26.744	.000
<i>ROM</i>	4.064	15.119	.000
Error	20.697		
Total	1.460.000		
Corrected Total	31.950		

The research results showed that there was a significant effect of video-based ROM telenursing training on increasing arm joint muscle strength in post-stroke patients with p-value of  $0,001 < 0,050$ . By providing the intervention for 1 month, the results of increasing joint muscle strength in patients were achieved. This is in line with the findings of Doria et al (2019) who stated that providing telenursing video-based ROM exercises at least twice every morning and evening for a duration of 15 – 35 minutes and performing at least 4 repetitions of each movement. The evidence of the effectiveness of ROM exercises in strengthening stroke patients shows that

100% ROM exercises are effective in overcoming the problem of muscle weakness in post-stroke patients (Eka Pratiwi Syahrim et al., 2019).

The utilisation of video-based telenursing ROM exercises is highly beneficial for patients and their families. The role of the family as a patient support system is of great importance in improving the quality of life of these post-stroke patients, thereby motivating them to perform ROM exercises at home, obviating the necessitu for hospital visits. Regular video-based ROM exercises will result in increased range of motion in stroke clients.

<b>7. Kneel Joint Muscles</b>			
Source of variation	Sum of Square	F	Sig.
Corrected Model	4.056 <sup>a</sup>	8.012	.001
Intercept	1.328.450	5.247.407	.000
Knowledge	2.687	10.613	.002
<i>ROM</i>	1.370	5.410	.023
Error	19.494		
Total	1.352.000		
Corrected Total	23.550		

The research results showed that the significance number for video-based telenursing ROM training was  $0,023 < 0,050$ . It can therefore be concluded that there is an influence of video-based ROM telenursing training on knee muscle strength in post-stroke patients. The result of this exercises are

relevant to the results of research by Oktavia et al (2020) which states that after being given 7 days of intervention, the disorder from stiff knee joint changed to be able to manage to move, the patients muscle movement increased with the muscle strength from 3 to 5, the patient's balance is characterised by a range of disturbances, from



severe to moderate, while their gait is similarly affected, exhibiting a spectrum of disturbances.

The utilisation of telenursing technology confers a plethora of advantages and benefits upon multitude of government. The advantages of convenience and increased reach, as well as cost savings, are evident immediately. One of the most significant nursing interventions is the

use of telenursing video-based ROM exercises, which are employed to enhance the client’s muscle strength and facilitate a speedy recovery, thereby enabling them to perform daily activities to the fullest extent, beneficial in prevention of contractures and the avoidance of permanent paralysis (Kusumawaty & Nurapandi, 2022).

<b>8. Hip Joint Muscles</b>			
Source of variation	Sum of square	F	Sig.
Corrected Model	10.516 <sup>a</sup>	18.097	.000
Intercept	1.386.112	4.770.812	.000
Knowledge	6.746	23.219	.000
ROM	3.770	12.975	.001
Error	22.372		
Total	1.419.000		
Corrected Total	32.887		

The research results showed that there was a statistically significant effect observed in post-stroke patients following video-based telenursing ROM training, with an increase in hip joint muscle strength. The p value was 0,001, which was less than 0,050. A one month intervention was found to result in increased joint muscle strength in patients. This is consistent with the findings of Doria et al (2019) which indicated that the provision of telenursing video-based ROM exercises is an effective method for increasing pelvic muscle strength. This involves undertaking at least two exercises each morning and evening, with a duration of 15 to 35 minutes, and performing at least four repetitions of each movement. The

efficacy of ROM training in enhancing muscle strength in stroke patients substantiates the assertion that 100% ROM training is efficacious in overcoming the challenge of muscle weakness in post stroke patient (Eka Pratiwi Syahrim et al., 2019).

The utilisation of vide0-based telenursing ROM exercises is beneficial for patients and families in facilitating the regular performance of ROM exercises. The role of the family as a support system for patients with stroke is of great importance in improving the quality of life of these patients. This is achieved by motivating them to perform ROM exercises at home, thereby increasing their pelvic muscle strength.

<b>9. .Ankle Joint Muscles</b>					
Source of variation	Sum of square	D	Mean of square	F	Sig.
Corrected Model	6.613 <sup>a</sup>	2	3.306	11.800	.000
Intercept	1.402.812	1	1.402.812	5.006.611	.000
Knowledge	4.164	1	4.164	14.860	.000
ROM	2.449	1	2.449	8.740	.004
Error	21.575	77	.280		
Total	1.431.000	80			
Corrected Total	28.188	79			

a R squared = .235 (Adjusted R Squared = .215)





The research indicates that the significant number for ROM telenursing training is 0,004 <0,050. This implies that there is an influence of video-based ROM telenursing on ankle muscle strength in post-stroke patients. The findings of this study are pertinent to the research conducted by (Denham et al., 2019), which asserts that YouTube videos can disseminate information and enhance understanding of the unmet needs of caregivers. Furthermore, they can be employed as an additional resource for stroke services in supporting caregivers, a proposition that is favoured by 87% of respondents.

A similar study conducted by Brown et al., (2019) found that video-based training can enhance stroke recognition by an additional 19%. However, continuous monthly or quarterly training is essential for maintaining stroke recovery at optimal levels, with 100% compliance. ROM exercises can increase the patient's muscle strength as long as it is done with the right technique and done

## CONCLUSION

Video-based ROM telenursing exercises are effective in increasing the strength of neck joint muscles, shoulder joint muscles, elbow and wrist joint muscles, hand joint muscles, arms joint muscles, hip, knees, and ankle joint muscles post-stroke patients by controlling family knowledge.

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correctly routine and regular (Kasma et al., 2022)

Subsequently, the research conducted by Nofrel et al (2020) indicated that the video-based ROM exercise programme was efficacious in increasing client's range of motion following stroke, thereby enhancing their capacity to perform daily living activities. The video-based ROM telenursing media allows patients and families to comprehend the information presented in an accessible manner, as the majority of knowledge is acquired through the eyes and ears (Muhsinin & Kusumawardani, 2020).

Video-based ROM exercise telenursing facilitates the rehabilitation of post-stroke patients and their families without the necessity of their attendance at a rehabilitation centre or hospital. Furthermore, it reduces the financial burden on patients, thereby enhancing the benefits of video-based ROM exercise telenursing for increasing muscle strength in post-stroke clients..

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