

# The Implementation of Hand and Foot Massage Therapy for Hemodynamic Stability in Patients with Hemorrhagic Stroke: Case Study

Sulistia Nur Sumardi<sup>1\*</sup>, Akhmad Must<sup>2</sup>

<sup>1</sup>Department of Nursing, Aisyah University, Pringsewu, Indonesia

<sup>2</sup>Department of Nursing, Muhammadiyah Semarang University, Semarang, Indonesia

\*corresponding author: [sulistianur5@gmail.com](mailto:sulistianur5@gmail.com)

Received October 28, 2024

Revised July 09, 2025

Accepted July 27, 2025

Available online August 17, 2025

## Abstract

**Introduction:** Stroke is a neurological disease with approximately 13.7 million new cases annually. The hemodynamics of patients may be affected by stroke. Hand and foot massage therapy is required to complement the treatment and prevent hemodynamic instability.

**Aims:** This study aimed to investigate the implementation of hand and foot massage therapy to lower blood pressure and improve MAP, breath rate, and oxygen saturation.

**Methods:** Two patients with hemorrhagic stroke were recruited through purposive sampling for this case study, following a nursing care approach. The inclusion criteria were as follows: hemorrhagic stroke, partially controlled ventilator, MAP >70 mmHg, heart rate > 60 beats/min, respiration rate > 12 breaths/min, oxygen saturation ≤100%, age between 55 and 64 years, no fracture, and did not get no sedation or muscle relaxants. The therapy was implemented for 40 minutes in three days, with a hemodynamic check-up every 30 min before and after the therapy (pre- and post-treatment).

**Results:** The findings showed that Hand and foot massage therapy considerably affected the hemodynamics. Patients' vital sign rates showed a reduction in blood pressure to 13.3 and 8.3 mmHg, MAP decreased to 13 and 2.3 mmHg, heart rate decreased to 14 and 21 beats/min, respiration rate decreased to 2 and 1 breath per minute; meanwhile, oxygen saturation improved to 1 and 0.3%, respectively.

**Conclusions:** Patients' hemodynamics could be stabilized within three days by hand and foot massage therapy for 40 min. To get the optimum results, the therapy could be given regularly

*Keywords: hemodynamic, hemorrhagic stroke, massage therapy*

## Introduction

Stroke is the second leading cause of death and third leading cause of disability worldwide. According to the World Stroke Organization, there are 13.7 million new stroke cases each year and approximately 5.5 million deaths occur due to stroke (Feigin et al., 2022). Based on 2018 Rikesdas data, the prevalence of stroke increased from 7% in 2013 to 10.9% in 2018. Stroke incidents were more common in the age group of 55-64 years (33.3%), while the lowest proportion of stroke sufferers was found in the 15-24 age group. Both men and women had nearly the same proportion of stroke occurrence.

Stroke is a condition characterized by rapidly developing clinical signs of focal and global neurological deficits that can worsen and persist for  $\geq 24$  h, potentially leading to death (Feigin et al., 2022). Stroke results from loss of brain function due to disrupted blood flow to the brain. This disruption impairs the oxygen supply to the brain, causing damage to areas that control functions such as walking, thinking, speaking, and breathing. If left untreated, patients may be in an emergency or critical state (Hemmatpour et al. 2020; Kurnia Rohmah et al. 2021).

Patients in critical conditions face hemodynamic status issues such as blood pressure, mean arterial pressure (MAP), heart rate (HR), respiratory rate (RR), and oxygen saturation. These conditions can lead to hemodynamic instability. Both pharmacological and non-pharmacological therapies can be used to address these issues in the intensive care unit. Pharmacological therapy that is effective in managing these problems includes sedation and analgesic medications, which help provide comfort and calmness to the patient. However, the continuous use of pharmacological agents can lead to dependency; therefore, nonpharmacological therapies are also necessary to help stabilize a patient's hemodynamics. These non-pharmacological therapies include deep breathing relaxation, music therapy, and hand and foot massage (Alimohammad et al., 2018; Putri et al., 2021)

Hand-and-foot massage involves the manipulation of soft tissues in the feet and hands in general rather than focusing on specific points on the soles of the feet that are connected to other parts of the body. This manipulation consists of five basic techniques: effleurage (stroking), petrissage (kneading), tapotement (tapping), friction (rubbing), and vibration (shaking) (Nakano et al. 2019). Physiologically, stimulating soft tissues in the feet can help the body produce a relaxation effect and stimulate the release of endorphins, reducing sympathetic nervous system activity, and activating the parasympathetic nervous system. This effect can refresh and relax the body by stimulating the peripheral nerves and enhancing peripheral skin circulation through the sympathetic nervous system, leading to vasomotor activity. This results in smooth muscle relaxation and vasodilation in the arterioles, which expands blood vessel circulation and improves venous return to the lungs for diffusion (Daud & Sari, 2020). Balanced oxygen and carbon dioxide concentrations in the tissues reflect an increase in oxygen saturation values, and stimulation at the respiratory center also contributes to a decrease in respiratory rate (Setyawati et al., 2016).

Previous studies have shown that foot massage significantly reduces the Mean Arterial Pressure (MAP), heart rate, respiratory rate, and oxygen saturation at the second measurement after 30 min of intervention. Foot massage stimulates vasomotor activity in the medulla. This vasomotor activity can decrease peripheral resistance and stimulate the parasympathetic nerves, thereby reducing the heart rate and increasing cardiac output. This enhances the delivery and utilization of oxygen by tissues to an adequate level. According to previous research, hand and foot massage therapy focuses on several massage points, including the heart and lung points (located in the palm and middle of the foot), to help stimulate the cardiovascular system. Solar plexus points (in the middle of the soles of the feet) help reduce tension and stabilize blood pressure. Brain and head points (tips of the thumbs and toes) support cerebral perfusion (Putri et al. 2021; Setyawati et al. 2016).

Patients with hemorrhagic stroke often experience hemodynamic instability such as increased blood pressure, irregular heartbeat, and impaired tissue perfusion, which can

worsen their clinical condition. Appropriate management of hemodynamic stability is the key to accelerating recovery and preventing further complications. Hand-and-foot massage therapy is a non-pharmacological approach that provides relaxation and stimulates the autonomic nervous system to achieve physiological balance. To date, scientific evidence regarding the effect of hand and foot massage therapy on hemodynamic stability, particularly in patients with hemorrhagic stroke, remains limited. Further research is needed to describe and analyze the application of this therapy and its impact on hemodynamic parameters. Based on the background described, this study aimed to conduct a case study on hand and foot massage to assess its effects on the hemodynamics of patients in the Intensive Care Unit (ICU).

## **Methods**

This was a descriptive case study using a nursing process approach that included assessment, diagnosis, intervention, implementation, and evaluation. The case study subjects were two individuals selected using purposive sampling with the following inclusion criteria: hemorrhagic stroke, use of a ventilator with partial control mode, MAP >70 mmHg, heart rate >60 beats per minute, respiratory rate >12 breaths per minute, oxygen saturation ≤100%, age 55-64 years, no fractures in the extremities, and no longer receiving sedation or muscle relaxants. The exclusion criteria were Patients who had fractures, trauma, or leg injuries, were in an anxious state, or were diagnosed with deep vein thrombosis symptoms were excluded.

An observation sheet was used as an instrument. The case study was conducted in November 2021 at RSUD KRMT Wongsonegoro Semarang. The intervention involved hand and foot massage for 40 minutes, with each upper and lower extremity receiving 10 minutes of massage using five basic techniques: effleurage (stroking), petrissage (kneading), tapotement (tapping), friction (rubbing), and vibration (shaking), each technique performed for 2 minutes. The massage was performed using light pressure with long, flowing, and rhythmic strokes, along with flexion, extension, and rotational movements applied to the foot area (toes, soles, and ankles) and hand area (fingers, palms, and wrists). A lubricant was used during the massage. In each intervention session, participants received a standardized 10-minute massage on each foot and hand. The indicators measured were blood pressure, MAP, pulse, respiratory rate, and oxygen saturation, recorded 30 minutes before and after the intervention (Setyawati et al., 2016). This study was approved the ethical test by the Health Research Ethics Commission of RSU Menggala (number B/800/2.2/284/VII/TB/III/2025).

## **Results**

The initial assessment conducted on November 26, 2021, for patients 1 (P1) and 2 (P2) revealed that they were 55 and 64 years old, respectively. Both patients had a level of consciousness classified as somnolent, with GCS scores of 9 and 8. CT tomography (CT) revealed an infarction in the right lentiform nucleus with signs of increased intracranial pressure and hypodense lesions in the right semi-ovale centrum radiata and left thalamus. blood pressure was 187/123 mmHg and 200/90 mmHg, heart rate was 120 beats per minute and 112 beats per minute, and respiratory rate was 21 breaths per minute and 22 breaths per minute, respectively.

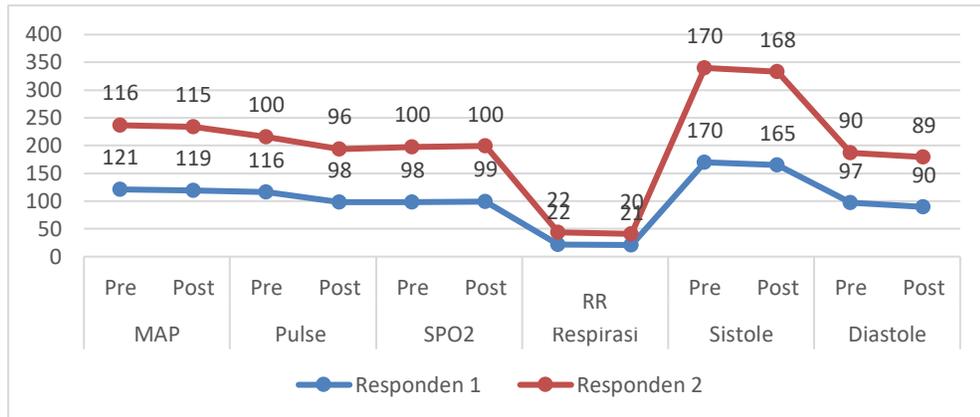
The assessment identified a nursing problem in both cases: ineffective cerebral perfusion, indicated by hypertension. The nursing intervention provided for both respondents was the management of increased intracranial pressure. This management

involved monitoring the vital signs of both the respondents, and hand and foot massage therapy was administered to support this intervention. The intervention was carried out over three consecutive days, with each session lasting 30 min (Setyawati et al., 2016). The evaluation focused on changes in blood pressure, MAP, heart rate, and respiratory rate before and after hand and foot massage. The recapitulation of pre- and post-intervention values is presented in Table 1. Figure 1 illustrates the daily trend of physiological parameter changes, highlighting the overall progression across the three-day intervention period.

**Table 1.** Hemodynamic Values Before and After Hand and Foot Massage Therapy For Both Respondents at RSUD KRMT Wongsonegoro Semarang From November 26-28, 2021

No	Hemodynamic	Observation						Delta	Mean	Mean
		Day I		Day 2		Day 3				
		Pre	Post	Pre	Post	Pre	Post			
<b>Responden I</b>										
1	Sistole	187	166	172	169	175	160	267	165	13,3
	Diastole	123	94	95	81	97	90	105	88,3	17
	MAP	144	118	120	110	121	119	128,3	115,6	13
	Heart Rate	118	113	110	95	119	98	116	102	14
	Respiratory Rate	22	21	24	21	22	21	23	21	2
	Saturasi Oxygen	100	100	98	99	98	99	99	99,3	1
<b>Responden II</b>										
2	Sistole	174	170	169	150	170	168	171	163	8,3
	Diastole	92	90	93	90	90	89	92	90	2
	MAP	119	116	119	116	116	115	118	116	2,3
	Heart Rate	116	86	116	89	100	96	116	97	21
	Respiratory Rate	20	20	22	21	22	20	21,3	20,3	1
	Saturasi Oxygen	99	100	100	100	100	100	99,5	100	0,3

Table 1 shows the effects of hand and foot massages on hemodynamics. The average reductions for each patient were as follows: blood pressure decreased by 13.3 and 8.3 mmHg, MAP decreased by 13 and 2.3 mmHg, heart rate decreased by 14 and 21 beats/min, respiratory rate decreased by 2 and 1 breath per minute, and oxygen saturation increased by 1 and 0.3%, respectively.



**Figure 1** Graph of Hemodynamic Values Before and After Hand and Foot Massage Therapy for Both Respondents at RSUD KRMT Wongsonegoro Semarang From November 26-28, 2021

**Discussion**

Cardiovascular disease, including the coronary age of patients, was 55 and 63 years, with age being a significant variable, as many diseases exhibit varying frequencies related to age. The increased frequency of stroke with advancing age is associated with the aging process, during which all body organs, including cerebral blood vessels, experience functional decline. Blood vessels become less elastic, particularly the endothelial layer, which thickens in the intima, leading to narrowing of the vessel lumen and reduction in cerebral blood flow (Kurniawan et al., 2019).

This study showed that both patients were male. Sex was significantly associated with the risk of stroke. This study showed that both patients were male. Sex was significantly associated with the risk of stroke. Women accounted for 57.1% of stroke deaths in 2019, with stroke accounting for 6.2% of all female deaths, while comprising 4.4% of all male deaths.8 In total, approximately 55,000 more fatal strokes occur in women each year than in men (Rexrode et al., 2022). Certain stroke risk factors are known to affect the sex differently. This is supported by research in Nigeria titled "Gender Variation Risk Factors and Clinical Presentation of Acute Stroke," which found that smoking habits and a history of alcohol consumption were more predominant among male respondents and were significantly different from those of female respondents (Watila et al., 2012).

Both respondents had a history of hypertension for three and five years, respectively. Hypertension is the most common preventable risk factor for heart disease, heart failure, stroke, myocardial infarction, atrial fibrillation, and peripheral artery disease, and is the leading cause of all-cause death and disability worldwide (Oparil et al., 2018). Increased systemic blood pressure causes cerebral blood vessels to constrict. The degree of constriction depends on the blood pressure level. If the blood pressure remains elevated for months or years, hyalinization occurs in the layers of the cerebral blood vessels, resulting in a permanently narrowed lumen. This is dangerous because cerebral vessels cannot dilate or constrict freely to accommodate fluctuations in the systemic blood pressure. A decrease in systemic blood pressure can lead to inadequate perfusion

of the brain tissue, resulting in cerebral ischemia. Conversely, an increase in systemic blood pressure can lead to a high perfusion pressure in the capillary walls, causing hyperemia, edema, and potential bleeding in the brain (Sofyan et al., 2013).

Hand and foot massages were applied as noninvasive hemodynamic parameters, indicating significant changes in MAP, HR, and RR after the intervention. These findings are consistent with those of other studies that demonstrated the effect of hand and foot massage on noninvasive hemodynamic parameters, including reductions in MAP, heart rate, and respiratory rate, whereas no significant effect was observed on oxygen saturation (Setyawati et al., 2016). Similar results were reported in other studies, which found that hand and foot massages help stabilize hemodynamics by lowering the MAP, heart rate, and respiratory rate (Kurniawan et al., 2019).

When patients receive hand and foot massages, they experience physical touch. Jin Shin Jyutsu's theory suggests that this dynamic touch can release energy blockages, which in turn can create mechanical energy in the body (Perry, 2012). This mechanical energy can induce feelings of happiness and relaxation, leading to physiological responses such as decreased MAP, heart rate, and respiratory rate within normal ranges (Azami et al., 2015).

Physiologically, hand and foot massage is a form of cutaneous stimulation that helps the body achieve homeostasis by regulating both extrinsic and intrinsic peripheral blood flow. In extrinsic regulation, hand and foot massage causes vasomotor activity, leading to smooth muscle relaxation and vasodilation of arterioles. This reduces peripheral resistance, which is reflected by a decrease in MAP. In intrinsic regulation, hand and foot massage stimulates the synthesis of the relaxing factor nitric oxide by endothelial cells lining arterioles and small arteries. Nitric oxide relaxes the walls of larger arteries, thereby enhancing venous return and increasing the stroke volume.

Hand and foot massage also stimulates parasympathetic nerve fibers, which release acetylcholine to reduce the frequency of depolarization, resulting in a decreased heart rate. This reduction in heart rate prolongs the ventricular filling time, leading to increased stroke volume and enhanced cardiac output. Improved cardiac output enhances blood circulation throughout the body, including in the lungs, leading to balanced oxygen and carbon dioxide exchange. With balanced oxygen and carbon dioxide concentrations in the tissues, oxygen saturation values increase, and stimulation at the respiratory center helps normalize the respiratory rate (Putri C et al., 2021)

In summary, the application of this journal indicates that hand and foot massage has a significant effect on MAP, HR, and RR, but not on oxygen saturation (SpO<sub>2</sub>). Thus, hand and foot massage can be considered as a non-pharmacological therapy for stabilizing noninvasive hemodynamics.

### **Limitations**

Patients in the Intensive Care Unit (ICU) often receive various medications, such as antihypertensives, sedatives, or analgesics, which can independently affect hemodynamic parameters such as blood pressure, heart rate, and respiratory rate. Variability in medication types and dosages among patients may influence outcomes, making it difficult to isolate the specific effects of massage therapy.

### **Contribution To Global Nursing Practice**

Massage therapy can alleviate discomfort, reduce anxiety, and promote relaxation, which is especially valuable for stroke patients who may experience high levels of distress. Improved comfort can indirectly contribute to the overall physiological stability and aid recovery. This approach offers a potential alternative to drug-based interventions that may cause side effects and improve hemodynamic stability through safe and manual techniques. It provides nurses with a gentle, patient-centered option for managing blood pressure and heart rate in patients with hemorrhagic stroke. Implementing massage therapy based on solid research findings strengthens the foundation of EBP, which is the cornerstone of modern nursing. The findings from this research could encourage nursing professionals to incorporate more alternative therapies in patient care, ultimately promoting a broader and more diverse approach to managing stroke patients globally. Therefore, the adoption of hand and foot massage therapy for hemodynamic stability in patients with hemorrhagic stroke could lead to a shift toward more inclusive and adaptable nursing practices, allowing nurses worldwide to deliver enhanced patient-centered care.

### **Conclusion**

This case study demonstrated that hand and foot massages affect noninvasive hemodynamic parameters including MAP, heart rate, respiratory rate, and oxygen saturation.

### **Author Contribution**

All authors have accepted responsibility for the entire content of this manuscript and approved its submission.

### **Conflict of interest**

The authors declare that they have no conflict of interest.

### **Acknowledgment**

The authors extend their gratitude to everyone who participated in the research and the preparation of this article.

### **Reference**

- Alimohammad, H., Ghasemi, Z., Shahriar, S., Sedehi, M., & Arsalan, K. (2018). Effect of hand and foot surface stroke massage on anxiety and vital signs in patients with acute coronary syndrome: A randomized clinical trial. *Complementary Therapies in Clinical Practice*, 31(5), 126–131. <https://doi.org/10.1016/j.ctcp.2018.01.012>
- Azami, H., Paveh, B. K., Rezaei, M., & Samadzadeh, S. (2015). The impacts of short-term foot massage on mean arterial pressure of neurosurgical patients hospitalized in intensive care units. *Iranian Journal of Critical Care Nursing*, 8(3), 133–142.
- Daud, I., & Sari, R. N. (2020). Pengaruh Terapi Pijat Kaki Terhadap Status Hemodinamik Pada Pasien Terpasang Ventilator Di Intensive Care Unit (Icu) Rsud Ulin Banjarmasin. *Journal of Nursing Invention*, 1(1), 56–64.
- Feigin, V. L., Brainin, M., Norrving, B., Martins, S., Sacco, R. L., Hacke, W., Fisher, M., Pandian, J., & Lindsay, P. (2022). World Stroke Organization (WSO): Global Stroke Fact Sheet 2022. *International Journal of Stroke : Official Journal of the International Stroke Society*, 17(1), 18–29. <https://doi.org/10.1177/174749302111065917>
- Hemmatpour, B., Poorshadan, S., Azami, H., Ashtarian, H., Almasi, A., Bijan, B., & Farahmand Moghaddam, N. (2020). The effect of foot massage duration on vital

- signs of patients with cerebrovascular accidents with lowered level of consciousness in the intensive care unit. *Journal of Babol University of Medical Sciences*, 22(1), 308–317.
- Kurnia Rohmah, I., Sri Endang Pujiastuti, R., & Rumahorbo. (2021). The Effectiveness Massage Therapy on Motoric Status among Non-Hemorrhagic Stroke Patients. *International Journal of Nursing and Health Services (IJNHS)*, 4(5), 575–583. <http://ijnhs.net/index.php/ijnhs/home><http://doi.org/10.35654/ijnhs.v4i5.481>
- Kurniawan, A., Kristinawati, B., & Widayati, N. (2019). Aplikasi Foot Massage untuk Menstabilkan Hemodinamik di Ruang Intensive Care Unit Rumah Sakit Umum Pusat dr . Soeradji Tirtonegoro Klaten. *University Research Colloquium*, 10, 510–515. <http://repository.urecol.org/index.php/proceeding/article/view/684/667>
- Nakano, H., Kodama, T., Ueda, T., Mori, I., Tani, T., & Murata, S. (2019). Effect of Hand and Foot Massage Therapy on Psychological Factors and EEG Activity in Elderly People Requiring Long-Term Care: A Randomized Cross-Over Study. *Brain Sciences*, 9(3). <https://doi.org/10.3390/brainsci9030054>
- Nur, S., Ismail, S., & Kaloeti, D. V. S. (2023). Nursing Technology Supporting Family Involvement in Critically Ill Patients: A Systematic Review. *Indonesian Contemporary Nursing Journal (ICON Journal)*, 8(1), 32–46. <https://doi.org/10.20956/icon.v8i1.28057>
- Oparil, S., Acelajado, M. C., Bakris, G. L., Berlowitz, D. R., Cifková, R., Dominiczak, A. F., Grassi, G., Jordan, J., Poulter, N. R., Rodgers, A., & Whelton, P. K. (2018). Hypertension. *Nature Reviews. Disease Primers*, 4, 18014. <https://doi.org/10.1038/nrdp.2018.14>
- Putri, N. N., Permana, B., & Lindayani, L. (2021). The Effect of Foot Massage on Hemodynamic among Patients Admitted in to the Intensive Care Unit of General Public Hospital, Indonesia. *KnE Life Sciences*, 6(1), 805–811. <https://doi.org/10.18502/kls.v6i1.8757>
- Rexrode, K. M., Madsen, T. E., Yu, A. Y. X., Carcel, C., Lichtman, J. H., & Miller, E. C. (2022). The Impact of Sex and Gender on Stroke. *Circulation Research*, 130(4), 512–528. <https://doi.org/10.1161/CIRCRESAHA.121.319915>
- Setyawati, A., Ibrahim, K., & Mulyati, T. (2016). Pengaruh Foot Massage terhadap Parameter Hemodinamik Non Invasif pada Pasien di General Intensive Care Unit. *Jurnal Keperawatan Padjadjaran*, 4(3), 283–292. <https://doi.org/10.24198/jkp.v4i3.291>
- Sofyan, A. M., Sihombing, I. Y., & Hamra, Y. (2013). Hubungan Umur, Jenis Kelamin, Dan Hipertensi Dengan Kejadian Stroke. *Medula: Jurnal Ilmiah Fakultas Kedokteran Universitas Halu Oleo*, 1(1), 152–226. <https://doi.org/10.33772/medula.v1i1.182>
- Watila, M. M., Ibrahim, A., Balarabe, S. A., Gezawa, I. D., Bakki, B., Tahir, A., Sulaiman, M. M., & Bwala, S. A. (2012). Risk factor profile among black stroke patients in Northeastern Nigeria. *Journal of Neuroscience and Behavioral Health*, 4(5), 50–58. <https://doi.org/10.5897/JNBH11.052>